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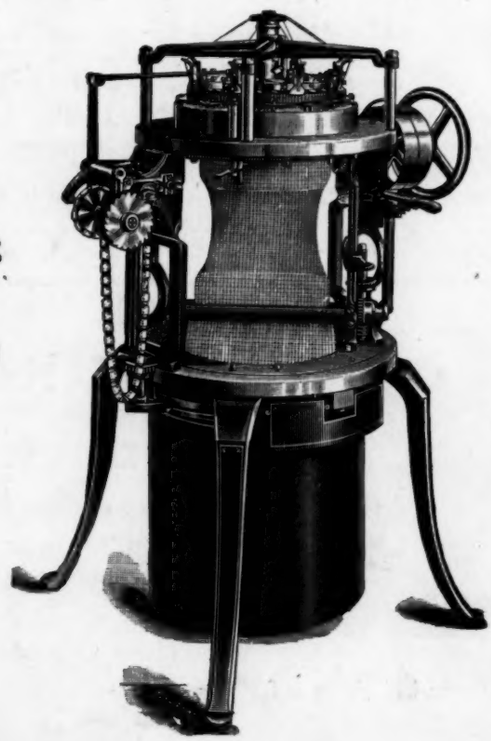

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OUR COMMERCIAL AGREEMENT WITH GERMANY.

The commercial agreement which has been entered into between Germany and the United States, is the most important step that has been taken by our government under the customs tariff act of 1897, and one in which all the manufacturing industries of the United States are more or less interested, as affecting the character and significance of an act of Congress that was intended as a measure of protection to our domestic industries against the competition of foreign manufactures. This agreement was made under the provisions of Section 3 of the tariff act, limited in its application to certain articles of foreign production, but not limited to any particular productions of the United States.

The textile industry is not especially affected by this agreement, so far as it relates to the act of 1897, but it is affected as it applies to the administration act of 1890. German textile goods are still obliged to pay the duties provided for in the textile schedules, but certain classes of American textiles can be entered at German ports at less than regular rates. These certain textiles are felts in combination with India rubber threads, or impregnated or coated with India rubber—a matter of little or no importance to our textile industries, as very few of these goods have an export trade.

This German agreement, however, has to be viewed from a broad standpoint of protection to our American manufacturers, and it is a question whether it will be viewed with complaisance by the trade when its full import is practically realized. It is more in the administrative features of the agreement than in the allowances that have been made in the rates of duty, so far as the United States is concerned, as all duties are governed by the market value abroad. The construction of this term, according to this agreement, means the export price when the merchandise is sold wholly for export, or sold in limited quantities in the home market, instead of requiring the value of this merchandise as though it had a demand at the location of manufacture. The construction of this term, as now agreed upon, allows many opportunities for under-valuation, which importers will take advantage of upon every occasion, without any scruples, as custom-house experience has shown for more than a hundred years. We, therefore, expect that many complaints will be made, and many cases adjudicated, affecting importations of hosiery, for example, from Chemnitz, and we should not be surprised to hear of similar cases relating to woolen and cotton fabrics made in England and the continent. Re-appraisement cases therefore, we expect will be greatly multiplied concerning German imports, as well as those of other countries, for the United States government has already given assurance that the administrative features of this agreement with Germany are to apply to all other countries. It is the administrative phases of this agreement, rather than the rates of duty that are to be disturbing factors affecting our American manufacturers of every kind, in which the textiles are involved, and which are destined to feel the effect more than is calculated upon at present unless our custom house officials are extremely alert, in which they must be more or less assisted and sustained by trade organizations equipped with facilities for detecting all species of under-valuation or evasion of the letter or intent of the tariff act.

So far as statistics are concerned, it would seem that the United States receives more benefit from the German agreement than Germany itself. For instance, according to official German

statistics the average annual value of imports of American goods into Germany for the period between 1903 and 1905, inclusive, was nearly $228,000,000, of which it is calculated only 3.31 per cent would be obliged to pay the rates of the German general tariff where lower conventional rates exist, that is 96.69 per cent of the total importation of American products will continue to enjoy in Germany the treatment of the most favored nation, whether this be free entry or the lowest rates accorded to like products of any other country. On the other hand, the total value of German goods that would participate in the benefit of this new agreement amounted in the fiscal year of 1906 to less than $1,900,000, or only 1.4 per cent of the total importation of German goods in that year.

Whether it is of any advantage to this country, working as it is under a protective system affecting imports of foreign merchandise, to enter into reciprocal arrangements with foreign nations, is a debatable question, as much so as the enactment of maximum and minimum rates of duty for the avowed or implied purpose of bargaining or making a shrewd or swapping trade, analogous to that between individuals who ask one price but are willing to take another. Reciprocity means, in one sense, the establishment of maximum and minimum duties, the latter supposing to be protective, while the former are more so, and to that extent becoming a needless tax upon the consumer who buys imported goods, provided the maximum duty were placed on the cost of such goods, as the importer and trade could easily apply, or take advantage of, if it were thought it could be done without affecting sales.

In order to secure to American products the entire German conventional tariff, in the reductions of duty not covered by the present agreement it would be necessary for the United States to make substantial tariff concessions to Germany beyond the scope of Section 3 of the present tariff law. This can be done only by means of a treaty of reciprocity, subject to ratification by the Senate and the House of Representatives, as a revenue measure.

FOREIGN COMPETITION IN COTTON GROWING.

There is no reason for entertaining fear that the production of cotton in the Southern States will be detrimentally affected by the efforts being made in other regions of the globe under the encouragement and material assistance of European spinners, no matter what success may attend these endeavors. That organized measures will be carried out for the growth of cotton in foreign parts, until something is accomplished toward showing the capabilities of climates and soils, where cotton is now indigenous, is evident. These experiments have been undertaken with a vast deal of seriousness, and money has already been spent lavishly, and more will be devoted to the carrying out of schemes that have been and will be inaugurated. That similar attempts have been made in years past, especially during the American civil war, and proved failures, cannot be accepted as deterring influences for controlling present and future efforts, nor can they be suggested as criterions to show that while they were failures, future schemes must necessarily be so, as times and methods have materially changed in the meantime, as the productiveness of soils and climatic conditions are better known; also the facilities of commerce have greatly improved for financiering enterprises of this kind.

That there is a determination on the part of foreign spinners not to slacken their efforts to extend the area of cotton culture in regions where it can be conducted under natural advantages was particularly emphasized as a distinctive feature in the discussions at the recent international congress of spinners at Vienna. The opinion, according to reports at hand, was almost universal that money and efforts should not be lessened to relieve the Europeans from the monopoly that the United States now has in the growth of cotton. It was not disputed that America is capable of growing enormously increased crops of cotton, but the impression seemed to be indelibly fixed that there was too much of a risk in keeping the cotton supply subject to the changeableness of climatic conditions of one country. With them, at present, the vital question is the supply of the staple, rather than its quality, however important this latter feature may be. If cotton can be produced upon any economical basis some means can be found to spin it into yarn of some size and number.

Harvie Jordan, in his address before the convention, somewhat met this general sentiment among the spinners by directing their attention to the great capabilities of the United States to supply all the cotton needed by the spinning world, without the necessity of depending upon other countries for supply. Mr. Jordan stated that the time "is never likely to come, or the place on this globe ever likely to be found, where cotton of the same staple, strength and flexibility will ever be grown profitably in competition with American cotton." What Mr. Jordan has said is undoubtedly true, but that is not the question foremost in the minds of foreign spinners, as the matter of supply, as we have already stated, is the chief point at issue. The matter of quality will claim attention later. Productivity is the only thing now thought of, and toward which all energy is being directed. Mr. Jordan's views are not to be denied, and the cotton growers of the South need not be disturbed about what is being done elsewhere, even if successful.

In connection with this it may be interesting to refer incidentally to the experimental work in West Africa that is being done under the auspices of the British Cotton Growing Association. For example, cotton cultivation in Nigeria is confronted with as many natural enemies as ever disturbed the equanimity of the cotton growers of this country. It is already recognized as of the utmost importance in plantation work that before any degree of success can be attained in cotton growing in Nigeria, continued capital and labor must be expended in solving the following problems, not unfamiliar to our planters, of cotton blight, the boll worm pest, etc. Already reports are sent back to England by the association's agents that there appears to be little hope for a sure remedy for the extermination of the boll worm pest, for instance, even where Pairs green and vegetable poisons are employed, owing to surrounding countless acres of bush, in which the moth hides and rests during the season when it is not breeding. Some means will be found undoubtedly to eradicate these breeding places by setting fire to the bush, for example.

This is simply an instance of many that might be enumerated, showing the obstacles which are to be met with in cotton culture in the region named, which undoubtedly afflict other regions in a similar, if not in an exact, manner. It will take at least a generation before foreign cotton regions can be expected to be brought up even to a semblance of competition with the cotton States of America.

For ourselves, we are not at all alarmed by what is being done by European spinners in the extension of cotton cultivation in the colonial possessions of Africa or Asia, so far as affecting the cultivation of cotton in this country, and we have no fear but what the demand for American cotton will always be sufficient to make it a profitable crop to be grown in the United States, and which will always be taken in preference to anything grown on a large scale elsewhere in the world.

We do not entertain any of the fear expressed by James MacColl in his recent presidential address before the National Association of Cotton Manufacturers, urging as a patriotic duty the encouragement of the growth of sufficient cotton in our Southern States to supply the world's requirements, and to discourage the

attempts being made in Africa, Asia, and elsewhere. Even if the Southern States cannot meet the world's requirements, as is the case today, the time is certainly not in sight when American cotton will not be given most decided preference. The time will never come, at least not for the next three or more generations, when the supply of American cotton will not be sufficient to meet all of the demands of American spinners and still have a fair amount for export.

The proportion of American cotton production and its domestic consumption has been running along quite evenly of late years, or since 1890, when the consumption was 34 per cent of the production, while in 1900 it was 39 per cent, and in 1906, 41 per cent. The average for the six years, 1900-1906, was about 40 per cent The ratio of domestic consumption to production does not increase with the relative increase in the number of spindles in cotton manufacturing. This is the case everywhere where there is an advance in the spinning of finer numbers of yarn, the same as is noted in the English cotton spinning industry, a statement well understood by every cotton manufacturer.

RELATIVE COST OF ENGLISH AND AMERICAN TEXTILE MACHINERY.

In a report to the Bureau of Manufactures, Department of Commerce & Labor, Washington, D. C., by Special Agent William Whittam, Jr., from England, on the equipment of cotton spinning mills in Lancashire, the following prices for machinery, paid by one of the large new spinning mills in that district, were given as those prevailing during the summer of 1905; though, at the time of writing, Mr. Whittam states that the prices were about 25 per cent more, and that many machine builders were unable to take orders for delivery under two years. We give these prices for the purpose of bringing them into comparison with those prevailing for American machinery:

Hopper bale breaker	$ 865.00
Hopper feeder	388.80
Exhaust openers with lap attachments	1,485.00
Single lappers (40-inch laps)	680.40
40-inch revolving flat cards	486.00
Drawing frames per delivery	66.00
Slubbing frames, 106 spindles each; per spindle (8½ inch gauge, 10-inch lift)	9.17
Intermediate frames, 136 spindles; per spindle (6¾-inch gauge, 10-inch lift)	7.51
Roving or jack frames, 204 spindles; per spindle *a* (4⅜-inch gauge, 7-inch lift)	4.86
Warp mules per spindle, 1,068 spindles, each (1⅜-inch gauge)	2.96
Filling mules per spindle, 1,236 spindles, each (1⅛-inch gauge)	2.75
Spinning frames per spindle, 360 spindles, each (1½-inch gauge, 5½-inch lift)	2.43

In many instances, American-made machinery can be bought at a less price than that noted above for English machinery, for example: Hopper feeders can be obtained in this country for $300.00; exhaust openers, with lap attachment, for $1,325.00; single lappers (40-inch laps) for $775.00; 40-inch revolving flat cards, $700.00; drawing frames (6 deliveries) the price is $62.00 per delivery, for five deliveries, $64.00 per delivery, for four deliveries, $66.00 per delivery—if mettalic rolls are used in place of leather-covered rolls, an additional charge of $15.00 per delivery is made; slubbing frames, $11.11 per spindle; intermediate frames, $10.59 per spindle; roving or jack frames, $6.75 per spindle. In regard to spinning frames, the American price is $3.05 per spindle, 2½-inch gauge, to which should be added the following for extras; separators, 10 cents per spindle; metallic thread boards, 10 cents per spindle; saddles and lever screws, 5 cents per spindle.

Mr. Whittam states in his report that English spinning machines are made with a narrower gauge than the American, involving less stopping of machinery to make changes from one number or quality to another. This he says means that the English have an advantage over the Americans, everything else being equal, of a reduced cost per pound for general expenses. In the United States no spinning frame is made with so narrow a gauge as 1½ inches, and nothing less than 2½ inches is built.

THE MICROSCOPE IN TEXTILE ART.

In this issue we publish the first of a short series of articles on "Some Properties of Wool and Cotton—A Comparison", by Howard Priestman, one of the leading authorities in Great Britain on the scientific relation between textile fibers, and the author of standard works pertaining to present methods employed in the manufacture of woolen and worsted yarns. Although this series may not be of a nature that mill men can put into practice in their daily avocations, because few are possessed with the necessary means for the microscopic examination of the fibers handled by them, yet every mill man should understand the natural characteristics of the fibers with which he is working, as a fundamental requirement for correct appreciation of their deportment under different manipulations. A cotton or wool fiber has more to it than a simple and smooth cylindrical form, and the value of either of these fibers lies in certain features that are beyond the reach of ordinary vision, and cannot be discovered except by the use of the microscope.

If feasible, every manager of a cotton mill, for example, should possess a microscope, and know how to handle it. This latter point is of as great moment as the possession of the instrument itself, and the user should, at first, receive instruction in this particular. The microscope is useful not only in determining the spinning qualities of the fiber, but also the defects arising from its imperfections in the woven or finished goods. For mill use the microscope need not be an expensive instrument, including the lenses.

A photographic camera would also be of great assistance to the mill manager in obtaining photo-micrographs of fibers of any particular lot or mixture, which he intends to run through the mill, as by keeping a record of the behavior of the cotton, for instance, of each lot, he can draw, oftentimes, valuable deductions from the photographs of the fibers and thus compare one lot with another. Considering the foregoing, Mr. Priestman's series may be perused to advantage.

THE MULE.

In this issue will be found an article entitled, "How a Mule is Driven", by William S. Taggart, a member of the German Society of Engineers, and a consulting and mechanical engineer well known in England, and also to a large number of cotton spinners in this country as the author of a standard work on cotton spinning. The subject and its treatment by this author will be appreciated by every cotton spinner who contemplates the use of the mule for spinning fine yarns for hosiery or for weaving. The mule is again coming into use with the progress that is being made in spinning fine yarns, both in the northern and southern mills. It is a machine that still has to be depended upon for the best results in these particulars. One of the most important things about the correct operation of the mule is the means and methods employed for driving it. On this subject there is no better authority than Mr. Taggart.

STEAM BOILER AND ENGINE INSPECTION IN THE MODERN MILL.

By HUGH NELSON.

In the strife of men for the betterment of their position in the race for supremacy, the principal desire and ambition seems to be centered in the question of securing a maximum output at a minimum cost, and of the means to this end possibly no single factor plays a more important part than motive power. The boiler and engine may very properly be characterized as the throbbing heart of the plant, transmitting through the medium of vario veins and arteries the life giving power by which the spind re turned, and the raw product converted into the manufactu. d material.

It is therefore not surprising that the far-sighted mill manager is straining every faculty for the perfection of this portion of his plant. The inventive genius and skill of the mechanical engineer have been taxed to the utmost in the effort to more fully develop the equipment of the plant with a due regard to economy of operation.

The large outlay necessary for the proper equipment of the modern boiler and engine room cannot be jeopardized by a failure to exercise the most careful supervision. It is a matter of proof from the statistics of nearly half a century that not only the efficiency but the life of the boiler, if we may use this term as applied to an inanimate object, is greatly enhanced by a periodical inspection under the trained hand and eye of the expert.

Expert inspection of motive power by men equipped for the purpose with both a practical and technical knowledge of their profession is, comparatively speaking, a creation of modern thought. It must be remembered that the first insurance policy ever issued in this country, indemnifying a steam user for loss in case of a boiler explosion and carrying with it periodical inspection of the plant, was issued only forty years ago. Both England and Germany had governmental and corporate inspection systems fully developed prior to the adoption of like methods in this country, and today, in these two great countries of the old world, the services of the expert inspector are in general demand.

It was not until the latter part of the nineteenth century that the necessity for expert inspection began to be recognized by the mill manager of this country. That this is a fact, is shown by the statistics of the general and State government records, as well as by the records of inspection and insurance companies operating during that period. There were in 1890 approximately 100,000 boilers in operation in the factories of the United States, while only about one-tenth of this number were receiving any government or corporation supervision. In the last decade of the century there was such a wonderful advance in mechanical invention as applied to motive power that the technical school, the boiler shop, the engine room, and the merchant marine service, were forced to contribute their quota of skilled men to swell their list of experts, qualified both by training and practical knowledge to properly fulfill the duties devolving upon them in the inspection of boilers and engines. The process of eliminating the unfit has reached a point of perfection little dreamed of half a century ago. The manufacturer of today can, upon application to the inspection department of a company underwriting insurance upon mechanical lines, secure specifications and drawings for a new installation; obtain the services of an inspector to witness the tests made at the boiler or engine shop during course of construction, for the purpose of seeing that the specifications are complied with; and when the equipment is finally set and ready for operation a certificate will be furnished, giving an accurate statement and guaranty of condition. The use of the hammer for the purpose of testing boilers has, to a great extent, superseded the hydraulic pump, but it was many years before the engineers of the old school would abandon the idea of the superiority of the hydrostatic test, although practical results showed the fallacy of their position.

Let us briefly consider the several points of advantage to be gained as a result of the inspector's work. These for the sake of convenience may be grouped under three heads: efficiency, safety and economy. If to maintain the highest degree of efficiency it is necessary to keep the motive power of the plant up to the proper standard and if expert inspection is the prerequisite of the latter condition, it must of course follow as a logical sequence that the inspectors' services are essential to the perfect maintenance of the plant's equipment. Few steam users realize the great saving effected by the discovery and prompt remedy of defects commonly found in boiler rooms. Imperfect boiler settings, leaks, corrosion and scale, improperly protected blow-off pipes, too high a water level and many other defects of a similar character cause a deterioration of the plant and a consequent loss of commercial value while the output is considerably reduced and the cost of maintenance largely increased. Why some engineers and firemen would rather work energetically to keep up steam when by less work properly placed in the cleaning and general care of the boiler better results could be obtained, is a mystery. The inspection reports on file in the chief inspector's office of an insurance company are most interesting reading and would probably greatly surprise the mill manager who refuses to entertain the idea of outside inspection on the ground that he has the best engineer in town in his employ. The best engineers welcome the periodical visit of the inspector, and are glad to be governed by his advice, for if a favorable report is made on the condition of the plant, the man in charge receives the commendation of his employer, if on the contrary defects are discovered, it is of vital moment to him that the responsibility for an accident should be shared by another.

The question of the maintenance of a plant at the highest point of efficiency for the purpose of obtaining commercial supremacy, should really occupy a secondary position to the vital question of the safety of human life jeopardized by a lack of proper diligence or failure to observe ordinary care and prudence. If the services of the inspector are of value in the one case, how much more so must they be where by the exercise of practical knowledge and skill protection of life and limb as well as of property can be secured. Both the common and statute law place upon the employer of labor certain well defined responsibilities in case of accident which are being largely increased by recent legislation. The safeguarding of machinery with the most approved appliances for the prevention of accident, proper inspection and supervision of same by disinterested persons, and the maintenance of the entire equipment in good condition, are among the absolute legal requirements in the modern mill. If the manufacturer or mill owner has equipped his plant on the most approved lines of mechanical design and has enlisted the services of an expert inspector for the purpose of securing efficiency and safety, he can rest assured that in case of accident involving loss of life no liability either in law or equity can attach to him. The laws of the three great States of New York, Pennsylvania, and Massachusetts demand inspection by a State official or by the inspector of the insurance corporation, and prescribe severe penalties in case of failure to comply with same; the certificates issued from these two sources being alone satisfactory to the State departments in question. It is only a matter of a few years when this example must be followed by other States and municipalities desirous of protecting the lives and property of the citizens within their borders.

THE VIENNA CONGRESS.

The fourth international conference of representatives of Master Cotton Spinners and Manufacturers' Associations was held at Vienna, Austria, the latter part of May, about 250 delegates being present from Europe, Asia and America.

The congress was presided over by Herr. A. Kuffler, whose address referred to the usefulness of the congress, and the presence, for the first time, of direct representatives of American planters. "Planters" he said "can hardly be classed as spinners and manufacturers, but they have, no doubt, been included in the congress because one of the objects of the international committee is to show that the planters and trade generally will gain more by the growers working in unison with the spinners rather than with speculators. The only person they wanted to exclude was the manipulator who did no good to anyone but himself."

C. W. Macara, well known to all cotton spinners in the United States as well as in Europe, and who is the chairman of the Federation of the Master Cotton Spinners' Association of England, in a report that he made to the congress, stated that in "dealing with the question of damp in cotton they invited all interested in the sale and purchase of cotton to tabulate the settlement or claims arising from excessive damp or country damage, with the view to the adoption in the future of remedial measures." Mr. Macara stated that it was the opinion of many spinners' associations that an organized system of short time be adopted as the most effective solution of the troubles which might arise in the future through shortage in the supply of the raw material.

Reference was made, during the session, to the Planters' and Spinners' convention to be held in Atlanta next October, to which the cotton spinners of Europe had been invited to send delegates. The members of the international committee, at its November meetings in London decided to cordially accept this invitation, and appointed the cotton contract commission to represent the International Federation, with a strong recommendation that as many members of the committee as possible, or other gentlemen interested in this important subject, should join them. The convention was fixed for a time when the cotton crop was being gathered in, and a most interesting tour through the cotton States had already been arranged for the delegates.

Such subjects as cotton growing and the transport of cotton were discussed, the work of the British Cotton Growing Association being dealt with exhaustively. Other papers were presented for discussion, among them being a report on "Means at Spinners' Disposal for Securing and Regulating an Adequate Supply of Cotton."

The European representatives, after heartily welcoming closer union with growers, made clear that they could not afford to slacken their efforts to extend the area of cotton plantations to all parts of the world where cotton could be grown. They said that though America be capable of growing enormously increased crops of cotton, there was too much risk in keeping the cotton supply subject to the climatic conditions of one country.

Perhaps no address was listened to with closer attention than that of Harvie Jordan, president of the Southern Planters' Cotton Association. Mr. Jordan said, among other things, that the time was coming when the producers of all the great staple commodities should come into closer touch and business relationship with the manufacturers and consumers of such commodities needed in the world's channel of trade.

"In our future dealings, we must learn to obliterate the boundary lines of the broad Atlantic as indicating an impassable barrier between the close, personal relationship of the growers of American cotton and the European spinners of that staple. The growers and spinners of American cotton are more vitally interested in the future success of that industry than all other interests that may be either directly or indirectly associated with it. The growers cannot succeed in the development of their resources along the desirable lines of production unless the spinners of their staple are prosperous and successful. Neither can the spinners and manufacturers of American cotton go forward unhampered in the full enjoyment of the great industry in which they are engaged unless the growers of the staple are induced, by profitable prices for the product of their labor, to furnish at all times an abundant supply of the raw material. While the middlemen may have been essential in the past and needed at the present time, yet they only act as the medium through which the growers can be reached by the spinners, and the raw product delivered more conveniently to the manufacturers. It is not only possible, but highly important, that a certain element of middlemen in the cotton business be eliminated entirely, which step would be advantageous to the interests of both the growers and the spinners. While the speculators have been most conspicuous as a side line of the cotton industry, they have so grossly abused their privileges and have become so detrimental to legitimate trade, that they cannot now claim to have any lawful reason to exist, and should be promptly outlawed from every civilized community in both America and Europe.

"Under the impetus of modern thought and education, the American cotton growers have awakened to the needs of giving greater intelligence to the growing, gathering, ginning, baling, storing, transporting, and marketing their great crop, so as to place the staple in the hands of the spinners in a better and more acceptable condition from a commercial standpoint. Until quite recent years the best energies and abilities of the growers were directed solely to production, and but little or no attention was paid to either the handling or marketing of the staple. But with the gradual broadening of a wider comprehension of the demands of the spinning industry and the quickening influences of better prices, a steady change for improvement is rapidly taking place.

"In the near future we hope to bring about such a revolution in the new system of marketing American cotton that it will no longer become necessary for the spinners to hedge their future sales by purchasing paper contracts in the cotton exchanges which are practically worthless, but that they can enter our markets and buy warehouse warrants or receipts which represent the actual cotton of specified grades and weights stored and ready for shipment. We propose to reduce the cost of storage and insurance to the lowest possible minimum by building and maintaining the most modernly constructed warehouses. We propose to eliminate the heavy losses from "country damage" by placing the cotton, when baled, in these warehouses, and thereby ensuring the first-class condition of the staple when ready for final shipment. We propose to develop the system of baling, so that the cotton be compressed to the proper density at the local gin, and thereby reduce the present heavy fixed charges for transportation, storage, insurance, and tare from which the growers and spinners, under existing methods, are suffering unnecessarily.

"To facilitate the marketing of cotton and to protect both the interests of growers and spinners alike, we believe that the enactment of such federal legislation as will force the adoption of a uniform classification of grades by handlers and exporters of American cotton is very essential and necessary. A standard of types adopted by the federal government and regulated by State or federal inspectors would simplify the present complicated methods of grading."

The opinion was generally expressed that the most important work accomplished by the congress was the interchange of views between the American growers and the European spinners, the arrival at an understanding that the interests of the two bodies

are identical, and the decision to work together and by improved methods to abolish unnecessary charges in preparing cotton for transport.

The American delegates to the conference were Daniel C. Roper, Walter Clark, A. S. Terrill, Samuel Clough, F. T. Charles, I. M. Johnson, Harvie Jordan.

THE COTTON BALE AS A SOURCE OF LOSS BY FIRE.

Benjamin Richards, Boston, Mass., read an exceptionally valuable paper before the National Fire Protection Association, New York, last May, at its annual meeting, from which we make the following abstracts:

No other product of American industry is packed and shipped in such a slovenly manner as is our cotton crop. This valuable fiber is enclosed in partly old, second-hand, loosely-woven jute rags, bound with almost enough steel hoops to hold the bale together until its destination is reached, and then

Showing the Round Sides of American (width 28½ inches) and Egyptian Bales (width 21 inches).

gradually torn to pieces by hooks of teamsters, by jack-screws used in squeezing the bales into holds of vessels and by general rough handling as it passes along its journey. It causes loss to all through whose hands it passes, and is not only a source of waste in itself but a source of danger to its neighbor. Its covering is so incomplete that we have become accustomed to its usual faculty of losing weight and spreading fire during its transportation. The amount of loose cotton which drops from the bales is so great that on the arrival of a cargo of American cotton it is a regular custom to divide the loose cotton among the consignees, this waste being so extensive that, were this not done, a serious loss would be entailed. Large quantities of loose cotton are stolen from warehouses and wharves, and in Liverpool a small army of people gain their support by collecting this cotton from about the wharves and shipping platforms. This is practiced to some extent in New York.

Without exception there is no greater fire loss sustained today on any merchandise, whether oils, naphtha, celluloid, gunpowder, or dynamite, while in transit between producers and consumers, as there is on the cotton crop of the United States. For the nineteen years preceding 1903, the fire losses on raw cotton alone, not including the cotton in gin houses or mills nor the damage to the building in which cotton was stored, amounted to over twenty-one million of dollars.

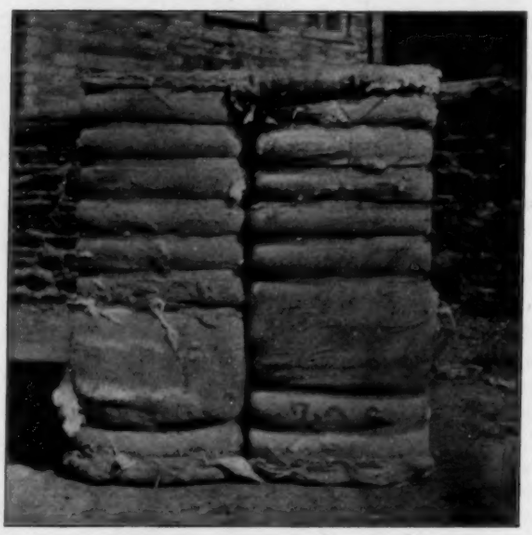
It can be said that no less than 75 per cent of all cotton fires are caused by sparks. The remaining fires are from ordinary causes, such as occur in other property, and are about equally divided between incendiary, smoking and matches. The manner of baling American cotton is the prime cause of the great fire loss from sparks.

Cotton is temporarily baled at the gin house. When these bales reach the large shipping markets they are further compressed in order to save space in cars and vessels. The bale is placed in the compress and pressed to a thickness of about twelve inches. Pieces of bagging are added, the object often being to bring the bale up to weight as much as to cover it. Between the compress and the mill the bale undergoes a continual expansion, tending to an oval shape. This continual movement causes air to be sucked into the bale as the density becomes less, the action continuing practically throughout the life of the bale, being often greatly enhanced by the breakage of some of the bands. This sponge-like characteristic accounts for the ready absorption of sparks by the bales. A spark falling on the bale follows one of the air passages thus formed and burrows into the bale where it may smoulder for weeks, there finding enough air to support combustion and remain undiscovered, possibly not bursting into flame until the cotton is well out to sea in the hold of a steamer or on its journey in the freight car. Often the fire is not discovered until the bale has been placed in a cotton storehouse at a northern mill. We would put this one feature as the greatest objection to the present bale. Were it compressed so that it would retain the shape with which it left the compress a major portion of the trouble would be avoided.

The covering used on bales is seldom of a continuous piece and it is very coarsely woven. Moreover, it is torn in transit and cut by samplers, leaving the cotton exposed, which makes cotton in storage especially subject to flash fires.

Experiments show that superiority in resisting damages by fire and water is somewhat proportional to the density of the bale.

In an immersion test where each bale was put under water for forty-eight hours, the gin bale absorbed 200 per cent of



Showing How Closely Egyptian Bales Pack Together.

water and the compressed bale 162 per cent.

In order to appreciate that there is no excuse for the poor condition of American cotton bales, we have but to turn to the bales produced in Egypt and India. Inherent fires in these bales are practically unknown. The Egyptian bale has a density of 40.4 pounds (average) per cubic foot, or nearly twice that of the American compressed bale. It is entirely covered with finely woven burlap and securely held by eleven strong steel straps,

which are fastened by small cast iron buttons. Of course, the bales have one or two small holes which are made in sampling the cotton, but the density is so great that the damage is but slight in pulling the samples. The bale is not subject to a flash fire and when accidentally dropped overboard in loading vessels the bales are said to be withdrawn from the water and sent along with the rest without danger of the consumer making claim for wet cotton. Moreover, in compressing these bales the pressure is supplied to the side having the lesser area, so that there is but little tendency for expansion to take place after the bale has left the compress, and we do not find it taking on the oval form as does our American bale, nor do the sample holes enlarge and throw off loose cotton. These bales can be packed in a storehouse, so that the whole density of the piles will be approximately 31 pounds per cubic foot against 14 pounds, which is about the limit of our bales. It will be seen, therefore, that in the cost of erecting storehouses alone there will be a saving of about one-half by simply compressing our cotton to a density similar to that practiced in Egypt.

The Indian bale is even more dense than the Egyptian. A representative of a Liverpool compress manufacturing company recently said, in discussing Indian bales: "No instance of a cotton fire on board ship or in a warehouse has been known with the Indian pressed bale."

THE COTTON SITUATION FROM THE VIEWPOINT OF THE PRODUCER.

BY HON. A. S. BURLESON.

The Southern cotton grower is aware that the American cotton manufacturers, having the advantage of close proximity to their raw material and the most intelligent labor in the world, have not lagged behind but you are likewise enjoying a generous profit from your business. I would not have you misunderstand me; the cotton producer is not envious of your prosperity, on the contrary, speaking for him, I beg to assure you that he is anxious for its continuance, in fact wants to and intends to share it with you. To do this is an absolute necessity, as can be easily shown. Cheap cotton can only be produced by the use of cheap labor, and under existing conditions this is not to be had, but on the contrary the increasing scarcity of labor is a serious problem confronting the Southern cotton planter, upon whom the responsibility rests to supply the world with its increasing demands for cotton. It may surprise you to hear that ten cent cotton is not profitable. It is true that this price will bring a small return of profit to a few large land holders who engage in cotton growing, but to the great mass of cotton producers, considering the increased cost of living, it means but little more than a bare living wage. Recognizing the advantages of her situation, the people who live in the South and engage in cotton production believe that they are entitled to an increase in the price of their cotton, in fact that they should receive a minimum price of twelve cents per pound for their product.

The actual conditions confronting the cotton planter are, the price for his labor to grow his crop is not only higher but growing scarcer, every element entering into the cost of cotton production, his food, supply, fertilizer, tools, implements and teams have advanced so much in price that he finds it impossible for him to grow cotton as cheap as heretofore. He only asks a fair price for his product. The cotton planter is not so foolish as to want to put the price of cotton so high as to diminish ultimately make himself the sufferer. At the same time, he feels that those who are interested as consumers of his product should not be so unwise as to want the price so low as to continue to make its cultivation unprofitable, because this policy would surely lead to a material curtailment of production, which all know would prove a calamity.

The cotton grower is justly entitled to a better price than he has been receiving for his labors—for many years he has been poor, very poor. The Civil War left him so impoverished that he was unable to protect himself by the adoption of ordinary means of business precaution to secure a fair price for his crop. His condition was such that he was compelled, in order to secure the actual necessities of life, to sell it as soon as it was gathered, which resulted in throwing the fruit of his year's labor on the market within the first three months of the cotton season.

By a system of warehouses, now building throughout the cotton section, he will be able to store and market gradually his product, thus avoiding the distressing consequences of dumping his crop on the market regardless of the price offered him. As a result of his efforts, through the agency of the Federal Government, reliable statistical information about his crop is now furnished him; an annual estimate is given of the acreage planted, he is advised in percentages of the condition of his growing crop, and is finally furnished an estimate of its probable yield for the current year. As its gathering progresses, an accurate ginners' report advises him of its size. In consequence, by utilizing this statistical data, the efforts of professional estimators have been neutralized and the legitimate law of supply and demand is at last exerting its wholesome influence in fixing the price of his important product.

The next step to be taken by the cotton producer, in furtherance of his interest, is to protect himself in some way against the manifest disadvantage of the varying standards of cotton classification used in the different sections of the country. Here, too, I feel sure that the interest of the manufacturer of cotton is identical with that of the producer. It is not an infrequent occurrence, in fact it is quite common, for a difference of fully a cent a pound for the same grade to exist between two markets for spot cotton within the same State. The only explanation for this lies in the difference of classification standards. In some instances certain markets for spot cotton have been known to purposely establish a very high standard of cotton classification in order to be able to offer, apparently, a higher price for middling cotton than that quoted by their competitors. This is becoming a common practice. It always tends to confusion, sometimes is used for purposes of fraud, and necessarily works injuriously to many in the cotton trade.

It is an accepted fact that the present grading of cotton is quite faulty. Recently I was given an opportunity to examine the standard of cotton classification used by the New York Cotton Exchange, and I was surprised to learn that it was graded only on color and cleanliness. Every manufacturer of cotton knows that when this is done one of the principal elements of cotton value is ignored. Dirty cotton can be cleaned, stained cotton can be dyed, and the cost of doing this is a trifle, but the length of the staple cannot be changed, and this is an important factor in determining what cotton is actually worth. Progressive farmers throughout the South, recognizing this fact, are taking steps, by seed selection and otherwise, to lengthen the staple of their cotton. Because of this, the output of long staple cotton is rapidly increasing and the demand for same is also increasing. In a few years, when more than a million bales of this cotton is brought to market, wth staples ranging from 1¼ to 1⅝ inches in length, then present methods of grading cotton must be changed and some means devised for properly grading it.

If a scientific method of grading could be adopted and it should be deemed practicable, I think three factors should be considered in fixing a standard:

1. Cleanliness and color.
2. Length of staple.
3. Strength of staple.

THE RELATION BETWEEN COTTON MANUFACTURERS AND RAILWAYS.

BY W. W. FINLEY, PRESIDENT SOUTHERN RAILWAY CO.

There is a marked tendency for the cotton manufacturing industry to segregate itself in more or less clearly defined localities. As a consequence, every cotton industry, from the growing of the fiber to placing the manufactured product in the hands of the final consumer, is dependent for its success on transportation.

The universal character of this traffic has resulted in making freight rates on raw cotton and cotton goods illustrate, in a striking way, the degree to which transportation charges are fixed by the operation of economic and commercial laws that are beyond the control of the carriers. Everywhere, rates on raw cotton and on cotton goods are determined by the competition of producing localities, of rival markets, of similar commodities, and of rival carriers. The competition of water carriers has played a very important part in the fixing of these rates. Freight rates on raw cotton from the Southern States are either controlled absolutely by water rates, or are very materially influenced by them. There is not a State in which any considerable amount of cotton is grown, from which a substantial proportion of the crop cannot find its way to the markets of the world by water. The cotton growing industry thus has this safeguard against unreasonable rates by rail, even if the railways of the South should not forget their own interest in the prosperity of their section as to unduly advance rates.

The remarkable development of the Southern cotton manufacturing industry could not have been possible without adequate transportation and just rates. It could not have been possible had not the railways of that section, realizing its advantages, co-operated with the pioneers of this development. The roads of the South have brought together the Southern planter, the Southern coal miner, and the Southern mill owner and have worked hand in hand with them and with the people of the South to place Southern products in distant markets. Neither in New England, in Lancashire, nor on the Continent of Europe is there a cotton mill located on a line of railway that can carry to its doors over its own rails not only the raw cotton needed by the mill, but also the fuel required for the generation of its power. In the South the same railway company is interested in giving to the cotton planter, to the cotton mill, and to the coal mine the most efficient service of which it is capable and is also interested in the prosperity of each. The men entrusted with the management of the railways of the South have taken a broad and comprehensive view of the problem of placing the products of Southern cotton fields and of Southern cotton mills in the markets of the world.

One of the best results for the South of the establishment of cotton factories and other manufacturing enterprises in that section has been in the encouragement of the Southern farmer to practice diversified agriculture. It gives him a home market for large quantities of perishable farm products which he can sell for cash in the spring and summer months, the period of the year in which he is most in need of ready money. He can often double his income by these sales. The creation of a means of profitable employment in any community benefits all the people in that community. In a purely agricultural locality there are few business opportunities for those who are not so situated that they can farm. Unless farms are large enough to be sub-divided, only one son can succeed his father on the home place and hence there is a steady drift of young men from the farms to the great cities. The building up of local industrial enterprises will check this and will give the young man opportunities for advancement at his own home.

Cotton, from the time it leaves the plantation until the manufactured cloth or finished garment is placed in the hands of the final distributor, gives transportation to the railways. Though rates on raw cotton are largely controlled by actual or potential water competition, the great bulk of the Southern crop is moved by rail. Even where it does not go direct to a mill center by rail, there is comparatively little that finds its way direct from the plantation to the water carrier. The dependence of this whole cotton industry in all its branches on transportation gives to each man connected with it a vital, personal interest in the adequacy of transportation facilities. When the maximum capacity of the carriers serving any community has been reached, further material progress in that community must stop. Mill owners, therefore, are all interested in the efficiency of the transportation lines serving their individual localities, but all mill owners, in Manchester, New England, and in the South, and all cotton growers, are interested in the adequacy and efficiency of the transportation agencies of the Southern States.

Legislation attacking the power of the roads to maintain their earning capacity and proposing to impose penalties upon them for failure to perform services beyond their ability, can only have the effect of injuring their credit, and crippling their power to afford the additional facilities so imperatively needed. The character of some of the legislation that has been enacted has been such that the railways have found it necessary to apply to the courts to test its validity. This action has been taken in no arbitrary or defiant spirit, but in the firm conviction that we are acting not only in the interests of the railways, but for the best interests of the people themselves, for it is to their interest that the railways on which they depend for transportation shall not be crippled. We have, therefore, submitted the validity of these laws to the courts, so that they may determine whether the constitutional protection to which the railways are entitled has been invaded.

IMMIGRATION.

BY E. J. WATSON.

In two branches of American industry the North and the South are alike starving for labor, notwithstanding the millions and more of people that are pouring into this country annually. These two branches are cotton manufacturing and agriculture—the latter being the foundation rock of American prosperity.

The South is crying for the indispensable worker to operate her spindles. From every fence corner comes the cry for agriculturists to raise necessary supplies and the raw cotton the world is demanding in constantly increasing volume. The labor supply is exhausted. The South is not, by crying out for white laborers and settlers, endeavoring to drive out the negro. We know that the introduction of white labor will stimulate the negro to greater exertions than he has ever been called upon to make in his own behalf, and make him a better citizen, if he can be made such. When the South built her mills she drew her labor from her fields. These were native white people, largely of the tenant farmer class. In South Carolina there are today, including children, in round numbers, 150,000 of our white population employed in the mills—more than one-fifth of the total white population of the State. These people were formerly producers. They have now been converted into consumers, and somebody must raise the supplies that are necessary, owing to the increase by 150,000 of consumers, and the corresponding decrease of producers. The negro is not raising supplies; he is

raising cotton, and as a cotton worker he is wanted in preference to every other class of help.

The labor shortage has become so great in the South that the building of manufacturing plants has practically ceased. Employers can no longer steal labor from one another, and, even now, in the "electric drive zone," if it may be so termed, thousands of horse-power is being made ready by development of splendid waterpowers to turn millions of additional spindles, affording rare opportunity for the investment of American capital and for the employment of American white labor—the carpenter, the iron worker, the machinist.

When South Carolina began this work it was quickly found that there was no hope of rescuing any number of these freshly arrived people from the clutches of the labor agents, of making them realize what the difference in the cost of living in the South, with twelve months' steady work eae hyear, meant to them. Then it was, after studying the situation carefully, we determined to try what has since become so widely known as the "South Carolina Plan," its ultimate design being to start in a good tide of agricultural settlers and build up the waste places. There was no "foundation" in the South—satisfied people who would write home to friends and relatives. This "foundation" had to be laid, and the applications from such people now being received asking that relatives and friends be brought to join them shows that it has been laid, not extensively, but substantially. Many will tell you there was much dissatisfaction on the part of those first immigrants. Of course there was. It was expected. It is always to be expected, but had there been only fifty good men and women who were satisfied, the foundation had been laid. Last summer the situation became so acute in the manufacturing industry that, after throwing every protection around our home labor, we sought and obtained the construction of the Federal laws and determined to prepay passages of a sufficient number to lay such a foundation, hoping at least 25 per cent. would be satisfied. We determined to as carefully as possible select the immigrant at his own home with a view to his fitness for the work ahead of him. Of course, some abused the privilege accorded, certified that they were experienced cotton mill and agricultural people when they were not, and it was from these that complaints arose. But the foundation has been laid. In the meantime the plants in the South have increased their wages, reduced their hours of labor and done much in the way of welfare work. Female and child labor conditions have steadily improved. While we sought good people in centers abroad where they had not been receiving as high wages as were prevailing in the South—desiring this element of early satisfaction—there was no purpose to bring in cheap labor, for the foreigner coming to a new country is a well-posted individual, and he never goes to work for less than the native help with whom he is to associate and assimilate. Some of the people who came to South Carolina in November, hearing of higher wages in New England, went there during the winter, but experiencing the difference in the cost of living and the climate, voluntarily returned to South Carolina.

TYPICAL SOUTHERN ITALIAN GIRL.
286,814 Italians Arrived in 1906, of Whom 240,528 Were From Southern Italy and Sicily.

Let us look into the labor sources of supply. In the textile districts of England are today to be found the most successful and satisfied operatives in the world. In England, also, there are to be found so many thousands of people without work that only a few weeks ago one of the leading newspapers of London spoke of "England, the home of the unemployed." This anomalous condition, however, is easily explained, and I will show you wherein it is possible to bring to the South desirable unskilled English-speaking people upon a proper presentation of the South's resources. In Lancashire many have wondered whence has come the vast amount of capital necessary to build the new mills. It has come largely through the operatives themselves, who have, I am informed, provided eight-tenths of the capital devoted to the construction of the new plants. The operatives, finding this opportunity open to them, saved up small sums and invested them. In the new mills a good spinner working a machine producing from 200 to 250 pounds more yarn per week than the machine of the old mill could do, earns $15 and more per week against his maximum of $10 in the old mill. Herein we have the element of satisfaction and the loss of desire to shift from one mill to another. Another curious fact is that while we in this country are trying to better the conditions as to woman and child labor, the proportion of women operatives in the Lancashire mills to men is as 5 to 3. Still another curious fact is that the operatives range in age from eight years upward. Taking the new people that have gone into the mills, two-thirds are women and girls. An Englishman expressed it to me: "Here is where women count as men." The earnings of female operatives average just under 20 shillings a week ($5); an experienced woman earns from 30 to 35 shillings (7.50 to $8.25) per week. An average spinner with a wife and five children has a weekly family income on the basis of average earnings of just about $35. Over in the textile districts of Germany the average earnings per operative vary from 24 pounds nine shillings per annum in Alsace, to 41 pounds 5 shillings in Rhemish Westphalia (from a little over $10 to $17 per month). Now compare some of these figures with what you gentlemen of the Northern and Southern mills pay your operatives. These figures were given me as late as April 10th of this year. So much for the condition of cotton manufacturing operatives.

I could discuss at length in the same manner the source of supply in Belgium, the Scandinavian Peninsular, in Austria and adjacent countries, and I could show you how the French laborer works and lives on $30 per month, more often $25, and is happy working ten hours per day. I could contrast the conditions of his methods of living, but perhaps it is not necessary. With all of these conditions and with the Brazilian government, for instance, spending $6,000,000 annually for the inducing of select immigration, even subsidizing a ship line at one-half million per year, it does seem to me that the opportunity for intelligently directed work in securing selected immigration into the United States in lieu of the indiscriminate supply of today should not only be generally encouraged by the people of this country, but by the national and State governments also.

With these sources of supply, and the fact that the history of

the East is today repeating itself in the South, the opportunity for the betterment of labor conditions seems unquestionable. As every one knows, the first mills of New England were operated by people drawn from the fields, but that after one or two generations these had sought for other occupation, their places being taken by foreigners. The process of their return to agriculture and other occupations will not extend over so long a period as in the case of the pioneers in Massachusetts, for the South has the experience of Massachusetts to guide her, and, furthermore, her mills are equipped generally with more modern machinery. The native grandchild rarely is found in the mill. For this reason the Northern and Southern manufacturer are being more closely drawn together. I believe that in the course of a short time hours of labor and scale of wages will likewise seek a common level, allowing, of course, for the difference of the cost of living as between the two sections. The South needs only capital, greater skill and labor. The North needs labor and new and improved machinery. The North has the advantage of the things I have indicated as being needed in the South, and the South has the great advantage of cheap raw materials in its favor.

I am glad that the United States government is looking into the immigration conditions at home and abroad, and I trust that the day is not far distant when there will be an intelligent understanding, through State official channels, of the needs of the several sections of this country, and a proper and practical scheme of distribution will be evolved looking to the meeting of those needs. One must experience the difficulties, the stumbling-blocks, the discouragements, the failures of apparently promising experiments that only come with the years of active work to realize that immigration matters cannot be dealt with as theories; that no subject in American economics and sociology is so severely practical as immigration. There must be a better understanding of all conditions on the part of the American employer, on the part of the American laborer, on the part of the several State governments, and on the part of the Federal government itself, if the crying needs of the hour within the borders of the United States are to be met. There are good sources of supply for material for good American citizenship, but those sources are not today furnishing to us any considerable proportion of the aliens being admitted. In its last analysis, as I see it, your needs, the needs of the farmer, the needs of agriculture itself, can only be successfully met in the next few years by means of Federal and State governmental co-operation.

COMBED COTTON.

BY JAMES T. FULLER.

Considering the nothing less than marvelous development of the many complicated machines for manufacturing the fibre in its transition into fabrics, it is remarkable to note that so little advance has been made in the direction of eliminating the objectionable features (of which there are many), of the universally used saw gin; in fact its only valuable characteristic is large production.

As manufactured today, the saw gin consists in detail of a series (generally 70), of soft steel saws of from 10 to 12 inches in diameter, with pointed teeth having a V-shaped crotch, made by punching and filing with a three-cornered file. These saws are secured on a shaft with wooden discs of about half their diameter, and in such a manner as to space them ¾ of an inch apart. A set or series of rough cast-iron bars, called "ribs," securely fastened to a frame, are located at an angle of about 60 degrees from the vertical. The saws are operated so as to partially project through the cast-iron ribs, and when rapidly revolved through a mass of seed cotton, they saw the delicate fibre from the seed. A brush, revolving at great speed, and located at the rear of the cylinder of saws, removes the ginned cotton fibre from the saw teeth. The machine operates continuously, as long as the seed cotton is fed to the revolving saws, while the cleaned seed are thrown out automatically.

The one merit of the saw gin is large production, and while many improvements have been made in the mechanical details, such as pulleys, frames, boxes, finish, etc., the saws used today are practically the same as were used one hundred years ago.

Considering the delicacy of the individual fibres of upland cotton, varying from ⅝ to 1⅛ inches in length, and averaging 1-1300 of an inch in diameter, it is plain that a rough metallic saw tooth passing through the lint at a great velocity, must brutally tear and cut the fibres from the seed to which they adhere very tenaciously. Therefore such cotton contains a large amount of "waste" which must be eliminated during its progress from the opening room to the loom, and it is obvious to one even imperfectly acquainted with the manner in which the lint is caught in the crotch of the saw tooth and violently torn apart, or from the seed, that the sheaths of nearly all the fibres are fractured in the process, thus affecting the strength of the resultant yarn and cloth.

JAMES T. FULLER.

I am now prepared to offer to the world the fruit of my endeavor, the Fuller Combing Gin, a machine which separates the seed from the lint at the speed of the saw gin, and at the same time treats the cotton fibre to a combing operation in the same manner as you fortunate ones would comb your hair.

In general appearance the "Combing Gin" is similar in size and exterior design to the saw gin, so much so in fact, that it will occupy about the same floor space, and can be installed and operated without changing or altering the driving, feeding and handling machinery as generally used in connection with the saw gin. The method of operation is also quite similar.

With the Combing Gin, a series of highly polished, round, hardened and perfectly tempered curved steel needles take the place of the rough punched and filed saws of the saw gin. These needles project about one-quarter of an inch from the surface of the cylinder and are of large diameter, so much so in fact, that they are far more durable and of greater strength than the soft-steel tooth of the saw gin. They are secured in a series of parallel rings, thus forming a cylinder corresponding in size, form and length to the usual saw arrangement. These smooth needles curve or hook forward in such a manner that they pass between the cotton fibres at an angle approaching a right angle, and consequently gather and are continually combing the fibres, enough of which adhere to the needles to be detached from the seed at a speed equal to the capacity of the saw gin, and so

gently as to preserve the strength and other spinning qualities which are impaired by the saw gin.

The Combing Gin is fed from the under side of the combing cylinder and by means of a spiked feed roller and a subsidiary revolving comb, whereby trash, sand and other foreign substances are removed; and the combing process has a marked tendency to blend the fibres, thus producing a brighter, smoother and more attractive sample.

FOREIGN TRADE IN COTTON MANUFACTURES.

By WILLIAM WHITTAM.

The mill man or merchant whose horizon is contracted will doubtless think that the present period of great demand and satisfactory prosperity in the home trade is an unpropitious time to bother about trade abroad, seeing that we cannot for the present easily supply our home requirements. We rank low as exporters of cotton goods when compared with the standing of five or six of our competitors and leaders.

Great Britain exports every year more yards of cotton cloth than our American mills produce for both home and outside trade. Over six billion yards expresses the volume of English foreign trade in cotton goods each twelve months.

American export trade in cottons can only be developed in countries which have not erected a preferential tariff barrier against us and so far we seem to have made no effort to enter the greatest of all neutral markets, British India. That country takes forty per cent of England's enormous cotton exports—notwithstanding the fact that she operates six million spindles of her own. England sends to India over 2½ billion yards of cloth a year against less than one billion yards to all other Oriental countries combined. Lancashire enjoys many advantages which we have not yet secured to ourselves, one of which is the greater range of cottons available to her spinners. Where American mills have their selection practically confined to home growths and Egyptian, our trans-Atlantic competitors have in addition East India, Brazilian, Peruvian and a considerable quantity of other varieties to choose from. This not seldom enables them to cheapen a mixing or to spin yarns having peculiar characteristics for special purposes.

In a rapid review of some of the most important conditions abroad which differ from American practice the very general separation of spinning and weaving into different establishments is observed. This enables the weaver to change his sorts to meet the ever-changing demands of the market at a minimum expenditure of time and expense. And it also leads to the more perfect development of the practical and administrative abilities of specialists in one branch of the industry. The maker of cloth can buy any kind of yarn he may need so that changes can be made with despatch and he is thus enabled to fill any order he may take without the inevitable great expense and delay which would be involved if the spinning department had to be changed from card room up. This separation has resulted in the development of weaving under the "room and power" plan. Weaving sheds known as "room and power" establishments are numerous and increasing, especially in East Lancashire districts. These consist of the ordinary shed type of weaving room built by companies for an investment and not to operate. They contain looms and motive power and are rented in sections to practical weavers.

There are many notable instances in England of men who were loom fixers starting with wife and children operating the first few looms rented, and who now own and operate very large establishments of their own. This impresses me strongly as an excellent plan to follow in the United States in manufacturing districts where cheap electrical power is available. It would undoubtedly lead in the long run to that form of specialization which has contributed so much toward Lancashire's present supremacy.

Large spinning mills are the rule, the trade on the other side having arrived at the conclusion that about one hundred thousand spindles and rather over than under this number brings down the per pound cost of investment, supervision and non-productive labor charges. This is more practicable there than here owing to finer average numbers they spin. I find that out of 64 new Lancashire spinning mills only 8 spin anything below 20s and all but 4 of the 64 put most of their product into 40s and upwards.

At the present time the United States produces nothing that will meet the requirements of the user of sized goods. Neither in "feel" nor appearance do any of the regular products of American mills approach those goods of competitors which have an established reputation of long standing. Although many American firms export grays or browns, despite their higher intrinsic worth due to their comparative freedom from adulteration, they sell reasonably near the same prices as British medium sized cloths, yet, as will be obvious to every manufacturer, the added weighting material in the foreign commodity materially reduces its cost to produce, and so long as the purchaser is not only satisfied but prefers the weighted fabric on account of its fulness and feel, American manufacturers cannot hope to grapple with their foreign rivals with any satisfactory measure of success unless they turn their attention to similar manufacturing.

Of immense importance is the concentration of the trade in the Lancashire district. Everything that can possibly be needed in every process of manufacturing is at hand and can be obtained quickly. Repairs are done by outside machine shops and thus the "odd hands," so costly yet necessary in American mills remote from populous centers, are there almost unknown. Manchester is the business center and the work of manufacturing and distributing are divorced completely, the "home trading house" standing between the maker and the retailer, while "shipping houses," so called, act in like manner as middlemen between the mills and foreign purchaser. All these houses have their offices in Manchester, and the Royal Exchange is in the very heart of the city, where practically the whole of England's great home and foreign cotton trading is done. Practically every mill in the country has its representative there each Tuesday and Friday, the two principal market days. The yarn spinner sells and the weaver buys his yarn "on change." Machinery agents, supply dealers, yarn and cloth agents congregate on the floor to the number of five or six thousand for two or three hours on market days.

PROPER MEANS OF IDENTIFYING COTTON.

By R. G. HITT.

During our experience and observation we have noticed that shipments across the water are often marked up, in anticipation of the gain in weight coming through the storage in the hold of the vessel—and again, it is an occurrence of the most common happening for cotton to be stored in damp situations, for this purpose, and again, the custom of placing cotton at the gin house flat on the ground, without protection, is another source of an artificial gain in weight.

It may be asked, if much of these gains are not lost before the cotton reaches the mills. This depends on conditions. It may be partly lost, it may be all lost, and an actual loss sustained, which is, of course, very common, especially where cotton is held in dry localities through the summer months. If bought by the mills, at the psychological moment, the mills will get all

cotton to spin, but this is a chance which must be taken, and with the selling interests, as a rule struggling to avoid a loss in weight, and with many determined to increase it, this chance becomes a chance indeed and one which should be avoided if it is possible to do so—and we believe it possible by concerted effort by the Association represented here today.

A law should be passed, either State or Federal, requiring the ginner to be a sworn weigher, to have his books open for inspection and to have his scales regularly tested, to be made to weigh every bale of cotton as it comes from the press, and before being exposed to the weather, and to have a fixed, indestructible, metallic tag attached to each bale of cotton, conforming to the receipt, by which its identity can be preserved until it reaches its final destination.

A bill could be prepared to cover these points, and added to it, the requirement that the ginner's tag, when removed at the compress, should be re-attached, so that the bales' identity should be preserved. If this law required the gin receipt to go with the bale, and this receipt to conform with the tag, it is evident that no fictitious gains in weight would be added to the bale, for the purchaser would become the custodian of the orginal weight at the gin.

It might be contended that if no gains are to be allowed, no losses should be allowed. A loss would show for itself, there is nothing to defend a loss, as there is nothing to justify a gain.

OBTAINING THE DRAFT WITH METALLIC ROLLS.

BY J. P. HUMASON.

On account of the crimping effect of the flutes on the metallic roll it is almost impossible to determine an exact draft that will meet all conditions from the gearing alone. Different weights of sliver yield different results and the draft obtained when running card sliver will often vary from that obtained when running a drawn sliver.

This may be accounted for by the difference in density of the two slivers, the drawing sliver being more solid and compact is crimped differently.

The best way to determine the exact factor or constant number to use in figuring the draft is to make a series of tests to determine the amount that the back roll (and the others as well) is crimping the sliver. To determine the amount of material delivered, in excess of what would be delivered by a smooth roll of the same diameter, proceed as follows:

Remove the front, second and third top rolls leaving only the back top roll in place. Then after starting the slivers and getting the ends at the back in running order cut off the ends in front close up to the back roll. Now turn the roll a certain number of revolutions, say six, and measure the length of sliver actually delivered. Suppose, for example, that a 1⅜-inch metallic back roll delivers 36 inches in six revolutions. Then:

1.375×3.14×6=25.86 inch del. by 6 revs. of smooth roll.

1.375×4.36×6=36 inch del. by 6 revs. of metallic roll.

36.00 inch ÷ 25.86 inch = 1.39 or 39 per cent increase.

This means that the metallic roll on account of its crimping action is doing 39 per cent more work than would be done by a smooth roll of the same diameter, and the draft—found by figuring from the calender roll to the back roll, using the calipered diameter of the back roll—should be divided by 1.39 in order to obtain the actual draft, and this should also be applied to the draft factor or constant.

It sometimes happens that drawing frames with metallic rolls have a poorly proportioned draft as originally geared, and, as a result, do not work to the best advantage. At other times a radical change in the amount of draft makes it desirable to reproportion the entire draft. In cases of this kind it becomes necessary to test each pair of rolls in order to determine the amount they crimp the fiber, before the gearing can be correctly determined.

After testing the crimping of the back roll, put in the third top roll and repeat the same experiment, after which try the second and front in the same manner.

The front roll crimp is best determined by running the sliver through the calender rolls, and after measuring the sliver delivered below the coiler, make allowance for the calender tension by dividing the actual length of sliver by 1.02 or 1.05 whichever is deemed more nearly correct.

Let us assume that the rolls have delivered a length of sliver in excess of the calculated amount as follows:

Front roll, 1.28 increase.
Second roll, 1.20 increase.
Third roll, 1.16 increase.
Back roll, 1.39 increase.

Then the working diameter of these rolls would be as follows:

Front roll 1⅜ inches + 28per cent = 1.76 inches.
Second roll 1⅛ + 20 per cent = 1.35 inches.
Third roll 1⅛ + 16 per cent = 1.305 inches.
Back roll 1⅜ + 39 per cent = 1.911 inches.

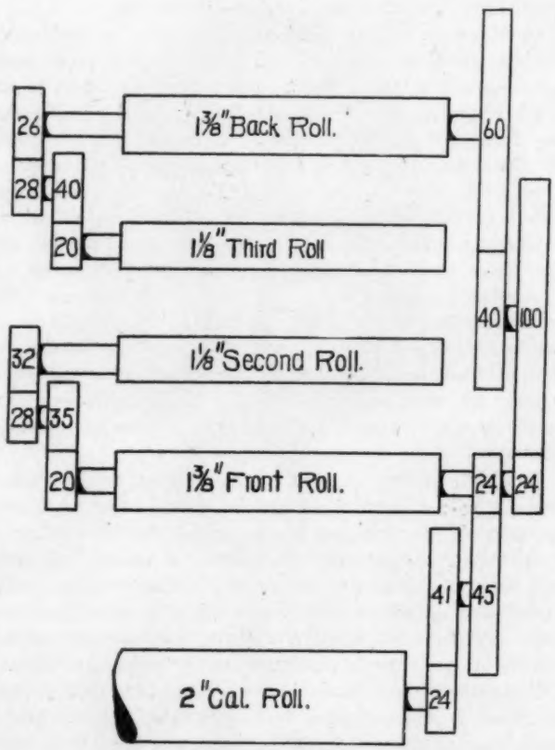


FIG. 1. DRAWING FRAME DRAFT GEARING.

These diameters are the ones to use in determining the actual draft or draft constants, instead of the calipered diameters.

From the accompanying diagrams of a drawing frame gearing, the following equations may be taken, giving the drafts between each pair of rolls:

$$\frac{1.76\times35\times\ 32}{20\times28\times1.35} = 2.607 \text{ draft between front and second rolls.}$$

$$\frac{1.305\times40\times\ 26}{20\times28\times1.911} = 1.256 \text{ draft between third and back rolls.}$$

$$\frac{1.76\times100\times\ 60}{24\times\ 40\times1.911} = 5.75 \text{ draft between front and back rolls.}$$

$$\frac{2\times41\times\ 24}{24\times45\times1.76} = 1.034 \text{ draft between front and calender rolls.}$$

$$\frac{2\times41\times100\times\ 60}{24\times45\times\ 40\times1.911} = 5.945 \text{ draft between calender roll and back roll.}$$

Another way of determining the total draft would be to figure from the 2 inch calender roll to the back roll, using its calipered diameter, 1⅜ inches, and afterward making allowance for its crimping by dividing by 1.39, or whatever per cent increase the back roll test yields.

$$\frac{2\times41\times100\times\ 60}{24\times45\times\ 40\times1.375} = 8.28 \text{ figured draft.}$$

8.28÷1.39=5.95 actual draft.

It is well to verify the results of such a test by taking several weighings of the sliver at both front and back of the frame, and it is also well to make a new series of such tests in case a radical change is made in the draft of the machine or the weight of sliver used or produced. As illustrating a recent test on this question the following figures are given:

The draft found by figuring from the calender roll to back roll was 9.62, and the extra work due to the crimping effect of the back roll was found by measurement to be 39 per cent.

9.62÷1.39=6.94 actual draft.

Six tests on the slivers entering and leaving the machine established the actual draft as follows:

Wt. Per Yd. Front.	Wt. Per Yd. Back.
54.7	379.3
55.0	377.5
54.3	358.
55.	381.
55.	363.
329.0	2233.1

2233.1÷329.=6.78.

The difference between these two results (6.94—6.78=.16) is easily accounted for, and is not enough to cause any trouble.

The drafts as proportioned in the preceeding example are about correct. There is some leeway possible, but the best results will be obtained by following this as a guide.

A rule for proportioning the drafts would be as follows: Use for a draft between the third and back drawing rolls 22 per cent of the total draft between the front and back drawing rolls; between second and third rolls use 33 per cent of the total, and 45 per cent between the front and second rolls.

This is not a hard and fast rule and might be modified as follows to suit different conditions;

Back and third roll—use 16 per cent to 24 per cent of the whole draft; second and third roll—use 30 per cent to 35 per cent of the whole draft; front and second roll—use 40 per cent to 50 per cent of the whole draft.

The draft between front drawing roll and calender roll should not be included in the total, but considered as separate from it. This draft should be only enough to keep the end from sagging. Expressed in figures it would be 1.02 or 1.05.

The pitch of the flutes on the rolls used in this test were as follows:

Front, 32 per inch of diameter; second, 32 per inch of diameter; third, 24 per inch of diameter; back, 16 per inch of diameter.

Rolls having flutes of different pitch would yield different results, although the principles involved would remain unchanged.

SOME PROPERTIES OF WOOL AND COTTON.

A COMPARISON.

BY HOWARD PRIESTMAN.

The manufacturer of the present day is bound to calculate on the effect of rapid travel and international amenities. His customers acquaint themselves with the styles in use in other countries when they journey abroad on their annual holiday. Fashion is more fickle than ever, and the weaver who is tied down to one class of goods is in a worse position than ever before. It is the versatile man who comes to the top, and nowadays no one can afford to tie himself down to any one class of material.

Today the manufacturers of Bradford spin their own worsted yarns, weave them into cotton warps, and find a great demand as well for silk and Belgian woolen yarns to make their goods attractive. Even the heavy woolen trade uses a lot of cotton warps, as well as cotton, shoddy, silk and other twists to get novel effects. In fact no textile manufacturer can now afford to bind himself exclusively in any one department of his trade.

With this end in view the present article has been prepared, that users of cotton may see something of the properties of wool, and users of worsted may know that they have much to learn from cotton spinners.

SOME PROPERTIES OF THE WOOL FIBER.

In order to obtain data which will throw light on those properties of wool which affect its spinning value, a large number of photographs and measurements are necessary if the relative sizes of fibers and the number of serrations per inch are to be estimated even approximately. In obtaining these data many other facts were brought to light which have an interest quite apart from the main line of investigation, and amongst these, the extent to which the edges of serrations protrude, is one of the most important.

The limited number of measurements which it is possible to make in a given time, give results which agree wonderfully with the known spinning value of the various wools which have been examined; but on the other hand, it must not be taken for granted that an extended investigation would in all cases confirm the figures here given. The most important feature of the series of figures which have been obtained, is the way in which the fine microscopic work confirms the accuracy of the apparently rough and ready work of eye and hand by which all wools are sorted prior to combing. With one exception the figures show that when wool has been properly sorted and not simply "classed," there are never sufficient stray fibers of wrong quality present, in any photograph, to throw the wool out of its proper place in the scale of spinning value. "Spinning value" is the term used to indicate the counts to which any fiber will spin, or in other words the comparative number of yards of thread which can be spun from a pound of combed wool.

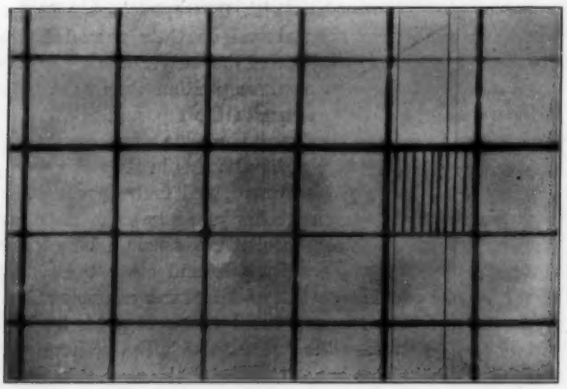
RECKONING COUNTS.

It is well known to every user, that there are an infinite number of methods of reckoning counts. Almost every different district adopts some peculiar variation, and until some common decimal system is introduced, it is necessary for each trade to reduce the counts of other districts to its own standard before calculations as to the weight of cloth can be made. The standards of cotton and wool differ considerably. In each case, when we say that a yard is 60's counts, we mean that 60 hanks of that yarn will weigh one pound, but, unfortunately, the hank in use for cotton is 840 yards in length, whereas the worsted hank only measures 560 yards. Hence it happens that there are 50,400 yards of 60's cotton in a pound whilst there are only 33,600 yards of 60's

worsted yarn in the same weight. In other words, cotton counts are only two-thirds the size of worsted counts; that is to say, 40's cotton are equal to 60's worsted, and in referring to their relative spinning value later on in this paper, cotton counts will be translated into their equivalent value in worsted, in order to obtain simplicity of comparison.

PHOTOMICROGRAPH.

Before going into details of the measurements of individual fibers, it may be as well to give some accounts of the way in



1-100 Eye-Piece Micrometer. Scale Magnified 60 Times.

which the photographs are obtained and used. It is a very common error to suppose that the difference between the actinic and visual foci which exists in every lens, is particularly exaggerated in microscopic photography and must be overcome by an alteration in the position of the ground glass after an accurate focus (as judged by the eye) has been obtained. Such an alteration is wholly unnecessary if isochromatic plates are employed, provided always that the slide to be photographed is colored red, and provided also that the objective which is being used is suitable for the purpose. This is no place to go into the optics of the question, but it may be stated as a simple fact, that the actinic and visual foci of red are so nearly alike that no alteration ought to be necessary when once a sharp image of a red slide has been focused on the ground glass. The next difficulty which stands in the way of any very great enlargement of wool fibers by photography, is their comparatively large diameter, and the frequency with which their curly nature makes them cross one another when they are mounted on a microscopic slide. However carefully the dyeing, dehydrating and mounting in balsam may be done, a slide which contains more than one or two fibers is nearly sure to have a large percentage of the fibres crossing one another at different places. To obtain a large number of measurements and to save time in the tedious process of making slides, it is necessary that each slide should have a large number of fibers upon it. It is necessary that all should be in focus at one time, even in places where two fibers are superimposed. This makes it necessary to use a lens of comparatively low power, because to say that a lens is of low power is practically synonymous with saying that it is of deep focus. To get large magnification with low power subdivisions have been made on the negative with a pair of very fine dividers, the negative itself is examined under another microscope, having a micrometer eye-piece. If the objective is approximately of one inch focus, each division representing one-thousandth part of an inch will cover about thirty divisions of the micrometer eye-piece. In other words, with a photograph taken in this way, examined under the lenses here named, each division of the micrometer eye-piece will be equal to thirty-thousandth of an inch on whatever object or slide is being examined by this method. Under this system it is only necessary to keep a record of the lenses of which photographs are taken, to ascertain with any desired accuracy the size of any object photographed, or the size of any part of the same.

PREPARATION OF MICROSCOPIC SLIDES.

The writer found that the preparation of microscopic slides was quite the most tedious part of the whole process. In order to get uniform results it was necessary to dye every fiber before mounting, and to get uniformity in dyeing it was necessary to remove all the natural and the applied fat from the wool fibers. Then it is necessary to dye them to some non-actinic shade with a dye which would permeate as quickly as possible into the substance of every individual fiber. As a matter of fact, no satisfactory red dye will color all the different fibers in a sample to a depth so uniform that they come out of equal density in a photograph. Very slight variations in the depth of color will make a serious difference, for it must be borne in mind that with ordinary plates red fibers will of course appear quite solid against a white background without any sign of detail on their surface, and it is only with isochromatic plates that detail can be obtained satisfactorily on the surface as well as on the edges of all the fibers.

(To be Continued.)

S. B. TANNER.

S. B. Tanner, the newly elected president of the American Cotton Manufacturers' Association, is president and treasurer of the Henrietta Mills, Henrietta, N. C., having taken the presidency of these mills upon the death of J. S. Spencer.

Mr. Tanner was brought up on a farm and in a mercantile establishment connected with a foundry and manufacturing company in Spartanburg, S. C., where the Clifton Mills now stand. He received his early education at the Mt. Carmel Institute. At the age of eighteen, he accepted a position as salesman in a general merchandise store at Union, S. C., afterwards taking a course in a business college at Baltimore, and upon the completion of his course there took a position in a wholesale and retail dry-goods establishment at Charlotte, N. C.

He assisted in organizing the Henrietta Mills, in 1887, and was chosen secretary and treasurer of this corporation, which position he held until he was elected to the presidency, though still retaining the treasurership.

Notwithstanding the year 1906 was a poor business year for the American silk manufacturer in price results, yet more raw silk was imported in that year than ever before in the history of the American silk trade. Notwithstanding the depressed scale of prices for fabrics, the imports of raw silk were 773,264 pounds in excess of the previous highest year (1904); but the value of silk consumed in the fabrics was $11,446,862.

With very few exceptions, a designer is expected to originate his figures, sketch it, put it on paper, build the cloth, and follow it to the loom.

The success of the Egyptian cotton industry may be explained by the one word, *thoroughness.*

Lustre is a property which wool possesses in a greater or lesser degree. Coarse wools are much more bright and lustrous than fine wools.

It should be remembered that there are two kinds of designing, the artistic and the technical, both of which are widely different. On the Continent this is recognized—especially in Switzerland and France—with the result that an artist originates the design, but a technical man puts it on to point paper and follows it to the loom.

FIGURED COTTON DESIGNING.

BY E. A. POSSELT.

We will take for our present subject the principle of constructing fancy cotton fabrics, by means of using two or more systems of warp and one system of filling, referring without question to one of the most important systems of designing for any fancy cotton manufacturer, since it refers to the construction of fancy dress goods, shirtings, etc., etc., i. e., fabrics constantly met with in the market, and for which reason the present article cannot help but be of the greatest interest to cotton manufacturers, their superintendents, designers, overseers of the weave room as well as the textile student in general.

Two or more systems of warps are used in the construction of these fabrics, one of the warps in connection with the filling forming the body structure of the cloth, the other system or systems of warps, i. e., the fancy warp system or systems, interlacing on this structure, according to a given motive, i. e., figure.

As mostly met with, the designing for the fabrics referred to is done in the shape of stripes, and for which reason we have selected this principle for the subject of our present article.

TWO SYSTEMS WARP, ONE SYSTEM FILLING.

This, as will be readily understood by the reader, refers to the more simple effects, i. e., one color figured stripes, a study of which cannot help but simplify the construction of fabrics made with three or more systems of warp, and to which we will refer later on.

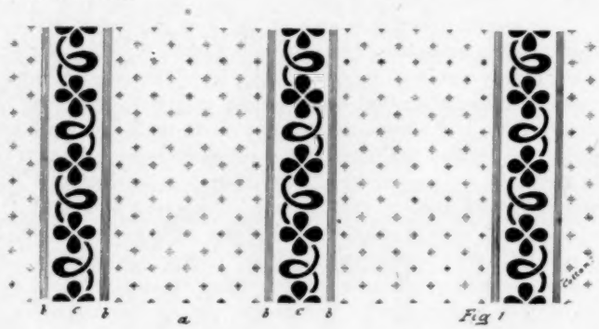


Fig 1

As already alluded to, two systems of warp are used, one of which is known as the ground or body warp, which interlaces with the filling the ground or body structure of the cloth, whereas the second system of warp interlaces with this ground structure after a given design, being only visible on the face of the fabric at certain places (corresponding to the design), while otherwise it is made to float on the back of the fabric, either floating loosely throughout the repeat of the weave, when not called for on the face of the structure, or, in connection with heavier fabrics, far-apart floats being stitched to the ground structure in certain places not visible on the face, or forming, by means of this stitching if done visibly, additional effects on the face of the fabric. For example, we may bring up in this way by means of spotting, certain portions of a flower or ornamental design, differing in this effect totally from the remainder of the design as produced by means of floating the figure warp prominently on the face of the fabric. Invisible stitching of the figure warp to the back of the cloth will only be possible in connection with interlacing the body structure with a weave which will permit such an affair, for example the $\frac{2}{1}$ 3-harness twill, the $\frac{2}{2}$ 4-harness twill, or, in fact, any little fancy weave where two warp threads rise at a certain pick, side by side, in order to thus permit the invisible stitching of the figure warp, as floating otherwise on the back of the fabric structure at such a place, i. e., raise the figure warp on a pick where on either side a body warp thread is raised by the ground weave employed, and which in turn will hide, i. e., cover the stitch of the figure warp on the face of the fabric. This, however, as mentioned before, refers always more or less to heavier fabric structures, in connection with the cheaper class of cotton goods, as a rule, the plain weave being used for the body structure, since it is the most appropriate weave for this purpose, and when no invisible stitching of the figure used warp is permissible.

In order to give the reader a thorough understanding of this method of designing, the accompanying three illustrations, Figs. 1, 2 and 3 are given, of which Fig. 1 shows us a fabric sketch of a fancy cotton dress goods. The same consists of three different effects, viz: the portion marked *a*, which refers to pure single cloth, i. e., figuring in this instance with the warp, or vice versa with the filling, if considering risers for sinkers, upon the plain weave, which portion of the structure has nothing to do with our present article, since it is nothing more than pure figured single cloth—one system warp and one system filling.

Stripes *b* of the sketch also refer to single cloth, i. e., to a satin stripe, using in this instance a 4-harness broken twill, also technically known as a 4-harness satin, for the affair, although as will be readily understood, any other satin weave might be used in its place; for example, a 6-leaf satin, which is a weave very frequently used for forming these stripes in connection with cotton fabrics. Again a 5 or 8-leaf satin might be used according to the capacity of the dobby, texture of the fabric, etc., etc. *c* shows us the fancy stripe as we want executed on the face of the fabric by means of an extra figure warp, and the explanation of which system of designing forms the subject of the present article.

Design Fig. 2, shows us one repeat of this figured stripe *c* worked out on point paper, i. e., it indicates the floating of the figure warp as visible on the face of the fabric, in order to produce the required design.

Diagram Fig. 3 shows us one repeat of "the complete analysis" of the fabric structure, both warp and filling ways, which diagram we will now describe in detail, in order to acquaint the reader with this method of figured designing. The complete repeat of the weave consists of 104 warp threads and 48 picks, of which 12 warp threads (see ×) refer to the formation of the two satin stripes, and 12 warp threads (see black square) refer to the figure warp, the remaining warp threads are all ground warp threads.

The arrangement of the various warps is indicated by its "gamutt" *e* on top of the weave, thus:

5 ends ground warp	5 ends
6 ends satin warp (and which in this instance refers to a heavier count of warp, whether plain, colored or mercerized)	6 ends
4 ends ground warp	4 ends
1 end figure warp and 1 end ground warp, × 12	24 ends
3 ends ground warp	3 ends
6 ends satin warp	6 ends
56 ends ground warp	56 ends
Repeat of Pattern	104 ends

The ground structure (see dot) is interlaced with the plain weave, the satin stripe (see ×) is interlaced with the 4-harness satin and the figure stripe (see black square) according to sketch Fig. 2.

Although it strictly does not refer to the subject of our present article, we will now give a short description of the construction of portion *a* of fabric sketch Fig. 1, which refers to what we technically call figuring either with the warp or the filling in connection with single cloth structure interlaced with the plain weave.

Considering the right hand section of our plan of interlacing Fig. 3, small and large dots are risers, it thus explains how to figure with the warp upon the face of a fabric interlaced otherwise with the plain weave, whereas provided we consider the small and large dots for sinkers, and white spaces for risers, it then would mean to us figuring with the filling upon fabric structures, interlaced otherwise with the plain weave. In the same manner as we used in the present instance, a small figured ground for the fabric structure between the stripes, we frequently will meet only with plain interwoven portions of the fabric, sometimes all plain, or, in other instances, using a 4-harness basket or a small 4, 6 or 8-harness granite weave, etc., for this purpose.

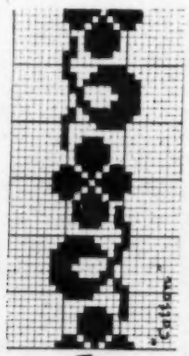


Fig. 2

With reference to the number of harnesses required for the execution of fabric sketch Fig. 1, or weave Fig. 3, the same refers to 22 harnesses as the lowest number, as indicated below the weave by means of its drawing in draft *f*, using in this instance:

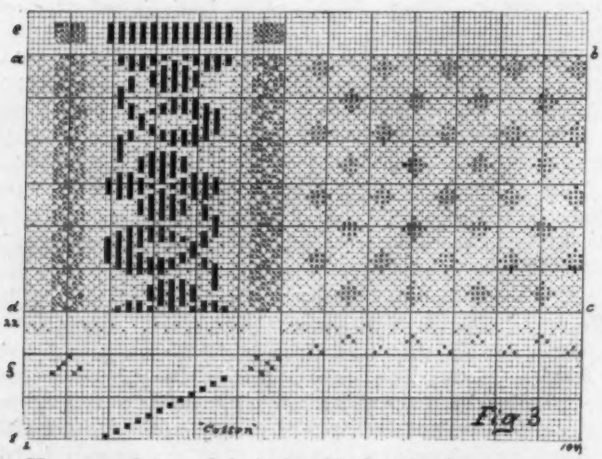


Fig 3

Harnesses 1 to and inclusive 12, for the figure warp (see black squares used).

Harnesses 13 to and inclusive 16, for the satin stripe (see × type used).

Harnesses 17 to and inclusive 20 (see large dots used), for the special spot effects in the plain woven portion of the fabric, and

Harness 21 and 22 (see small dots used), for the plain weaving warp threads, which it will be advisable to draw on 4-harnesses, calling in this instance for every harness of a 24-harness dobby.

As will readily be understood, the general effect, as shown in connection with fabric structure Fig. 1, can readily be heightened, without increasing the number of harnesses, by introducing cords, etc., etc., which can be excellently worked from the same harnesses as producing the satin stripe.

(To be Continued.)

A TALK WITH MY BROTHER OVERSEERS AND SUPERINTENDENTS.

C. G. F.

For a number of years as overseer and three years as superintendent in a cotton mill, it has been my custom to keep a note book in my pocket, and when things came up from time to time (somewhat out of the regular routine you might say), to make notes of them. Not that my memory was not good, but as a training for my memory and for the good of my job.

I thing I can truthfully say that my present employer, whom I have worked for for the past two years, has but once or twice told me the second time about anything he wanted done. In other words, I do not forget orders he gives me. I take notes of these things. I believe this is one of the strongest reasons why I have been promoted as fast as I have.

All overseers and superintendents know how vexing it is to tell a subordinate to do something and in a reasonable length of time find that it has not been attended to. Why do you find so many ex-superintendents and ex-overseers working as second hands and section men? I now have in my employ an ex-superintendent as second hand, and an ex-boss weaver as loom fixer. They are both good men, have good characters and are good mill men. But there is a reason of course. Why don't we as overseers and superintendents make a more concentrated study of these things and try to find out why so many of us lose out, and guard against losing out from the very same causes that have made other men lose their jobs?

I believe that mistakes give us the best experience we get, providing we remember them and do not make the same mistake twice, and in the same way note the other fellow's mistake and profit by it, avoiding that same mistake ourselves. So many of us are selfish and narrow-minded enough to think our ideas are always better than the other man's about our work. Then why do you have a man over you? To illustrate what I mean: The superintendent goes to the overseer of weaving and says, "I want you to make a change in such and such a way. I think it will help your production or lower your cost on seconds," as the case may be. Now the overseer is really short of help and his work is running badly this month, and he does not see any good the change would do anyway. Certainly he doesn't, or he would have had the idea first; therefore he does not go about the change as if he had had the idea himself. He says to a second hand, "The superintendent wants us to do so and so." The very tone of his voice speaks his disapproval of the idea, and the second hand catches it. Thus the order passes on down the line and of course dies out without the results the superintendent was hoping for.

The overseer triumphs with, "I told you it would not work." Now, brother overseers, you know you can recall instances of the very same nature, probably not so plain as I have pictured, but the practical man knows the point I have tried to make because he has been there, so to speak. What is the result? Well, the superintendent, of course, is sore, he thinks less of the overseer, he sees the overseer did not go at it as he would have done himself.

It has been the height of my ambition to please my employer.

If he tells me to make a change and I think it is not practical, I feel it my duty to lay the facts before him, not showing my disapproval, or getting excited, then if he does not change his mind, I study the matter over very carefully, before going to my subordinates, for the best way of accomplishing what my employer wants done. I try my best to see it as he does. Yes, I believe it will work. Going to the first man, I say, "Mr. A., I want you to arrange to do so and so," going into detail with him, showing the good results we will get out of such a change, and

assuring him of my confidence in the change going through without a hitch.

These are the kind of things we must train ourselves for, brother overseers, if we succeed. There is not an overseer but knows these things are true, yet still you are not doing the very things you know are best for you. Right there is the idea; it is not so much that they do not know that so many men lose out, but because they do not put into practice what they know.

Study your employer from a human nature standpoint, try to think as he thinks, adding your own practical thoughts to his, and try your very best to carry out his ideas. Take notes of every suggestion he makes as he goes through the mill with you or looks over your work, then let him see by your actions that his ideas have been faithfully carried out. I do not mean to "boot lick" your employer. No, "familiarity breeds contempt." Always show your pleasure of being in his company by his invitation, but by all means do not "butt in."

Here are, I think, a few good ideas for an overseer of weaving on Draper looms: If your shuttles wear badly on the back, (1) line up the reed and back boxes; (2) take a common oil stone and fasten a ten-pound gear blank to it, lay your reed on a board three inches wide, have the oil stone passed over the reed about fifteen or twenty strokes; this will make it very smooth and leave each dent in perfect line. Center punch the bar at end of reed so you will know which side of reed has been dressed. Always draw the reeds so this dressed side will be next the shuttle. Your shuttles should have the date marked on the inside with ink when they are placed in the loom. Section men should have to come to overseer or second hand for new shuttles. Then date of old shuttle can be noted to see if it has lasted long enough.

Smash hand should have a book with a page for each section and record of every break out and the number of the loom should be kept. These should be reported once per month or week and hung up where all section men can see them. Almost all mills make a monthly report of supplies and production of each section, and I think it a good idea to offer a premium of $2.00, say, for the best report. Have your weavers save the bad knots and gouts that cause the looms to stop; in looking them over you will probably find cause to complain to the boss spinner and thereby help the running of your work.

As we all know, the oiling of looms is a very important thing, especially with Draper looms. It is the general custom to put a cheap man in charge of oiling a certain number of looms and

APRIL, 1907	1	2	3	4	5	6	8	9	10	11
Pick cams	1	1	1	1	1	1	1	1	1	1
Harness cams	1		1		1		1		1	
Crank and cam shaft boxes	1						1			
Pittman arms and dagger rods	½						½			
Rocker shaft boxes				1						
Warp stop motion								1		
Let off		1								
Take up										
Batteries										
Sand roll bearings						1				
Pick shaft boxes									1	

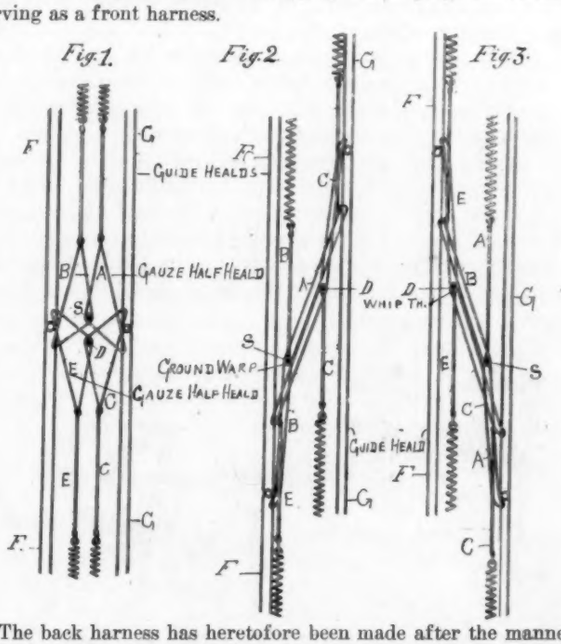
expect him to keep them up. A good idea is as follows: Take a small book that can be carried in the pocket and write down all the parts about the loom to be oiled; have a space for each day in the month. Start your oiler by telling him to oil a certain place or places on all the looms, and when he is through return to you. Mark the places on your book that you have told him to oil, and when he returns give him others. By this plan you can glance at your oil book and see the parts that need oiling worst. You can in this way be sure the oiling is done correctly.

On April 11th, when the oiler comes up for orders, and the oil book stands as above, I tell him to oil either the batteries or let-off next, as they have not been oiled this month. The sample leaf is of course not complete, but expresses the idea. The second hand or overseer will find that it is practically no trouble and that you will derive great benefit from its use. Other important things you wish to remember may be added to this book, such as: Fill up fire buckets, clean out humidifiers, etc. You can always tell just when anything was done and when it needs attention again, by keeping it this way.

ARRANGEMENT FOR CROSS-WEAVING.

We show, herewith, an arrangement for cross-weaving, Fig. 1 being a portion of a method forming one embodiment of the arrangement in elevation, in the position of rest. Figs. 2 and 3 are elevations showing the arrangement at the end of the two treadle movements.

In gauze weaving the weaver has to work with pairs of warp threads, one of each pair being termed the "ground-warp" and the other the "crossing-warp" or "whip-warp," so that on the one treadle movement or on one pick the whipwarp thread will be brought up on the right side of the ground warp, and that on the next pick the whip warp thread will be brought up on the left side of the ground warp. This has heretofore been accomplished by the employment of a back harness together with a front harness, or in jacquard gauze weaving by the employment of mails serving as a front harness.



The back harness has heretofore been made after the manner of a taffeta harness, while the front harness was the gauze harness proper, being composed of guide healds or standards and of gauze-half-healds or doups. Each ground warp and each whip warp was drawn once through a gauze-half-heald. The number of gauze-half-healds was thus equal to the number of ground warp threads plus the number of whip warp threads.

In operation, when the guide heald F, F is moved downward, the guide heald G G rises, and vice versa. When F F is lowered, the gauze-half-heald proper B is drawn downwardly therewith, and the ground warp thread S comes, as the gauze-half-heald proper A, follows S without resistence, downward to the left of the whip warp thread D (Fig. 2). The guide heald G G rising, the gauze-half-heald proper is raised therewith, and the whip warp thread D comes, as the gauze-half-heald proper E follows it without resistence, to a point upward to the right of the ground warp thread S. If on the other hand the guide heald G G be low-

ered (see Fig. 3) the gauze-half-heald proper A is drawn downward therewith, and the ground warp thread S comes, as the gauze-half-heald proper B follows it without resistence, downward to the right of the whip warp thread D. The guide heald F F rising, the gauze-half-heald proper E is raised therewith, and the whip warp thread D comes, as the gauze-half-heald proper C follows it without resistence, to a point upward to the left of the ground warp thread S. From this arrangement, wherein both on the treadle movement heretofore called the movement of the gauze treadle, and on the treadle movment heretofore called the movement of the taffeta treadle, the shed is formed exclusively by means of gauze-half-heald proper, under otherwise like conditions there are effected reduction in expenses and increase of production.

HOW A MULE IS DRIVEN.

BY WM. SCOTT TAGGART, M. I., MECH. E.

The self-acting mule is one of the most interesting machines in the whole range of mechanics, and it offers many ingenious solutions to difficult problems.

One peculiarity of the mule that may have struck the thoughtful student, lies in the arrangement of the various methods of driving incorporated in the mule mechanism. It will not be time wasted to just glance over the means adopted to give motion to the several parts. For this purpose a few drawings are given, and these may also prove useful to the reader in many other directions than the subject of this article.

In Fig. 1, the main shaft of the headstock is provided with two sets of driving pulleys; but in reality it is only a single driving, duplicated in order to reduce the distance moved by the strap in going from the fast to the loose pulley. A belt from the counter shaft performs this function, and it is this belt which bears the greatest strains in driving the mule. As a rule it is almost vertical, and consequently is pieced up very tightly to prevent slippage. It naturally follows that a good deal of unnecessary power is wasted in friction on the headstock shaft, but an advantage is gained by having an elastic drive. The ad-

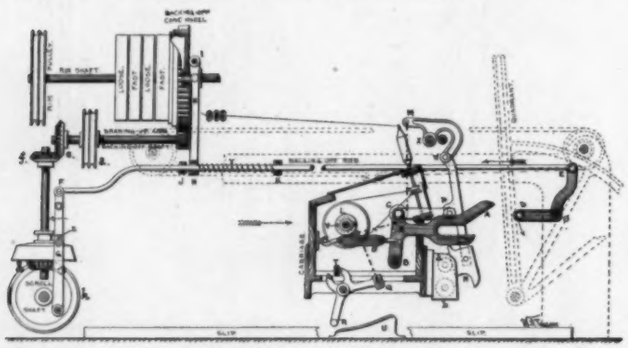


FIG. 1.

vantage of elasticity is perhaps more clearly seen, however, in the strap that couples the main driving shaft of the mule room to the counter shaft. Here the strap is tight and drives in a normal manner when the mule is working, but for an instant, when the mule carriage is just starting out from the roller beam, such an enormous increase of power is required to move the carriage and start the spindles that the belt sags tremendously on one side and slippage takes place to relieve the whole mechanism of a too sudden start.

On reference to Fig. 1, it will be noted that the headstock shaft is provided with a band or rope pulley. This is the rim pulley, and through it the tin drum is driven. This drive is not without interest, for the problem to be solved was how to drive a shaft that moved a considerable distance to and fro, from a fixed shaft that was at right angles to it. In the mule the problem has been solved in a beautiful manner. In Fig. 2 the rimband comes from the rim pulley (shown in Fig. 1) passes over a jockey pulley (A C) in the direction of the arrow and on to the front of the carriage over a loose pulley E and on to the pulley B on the tin drum. From here it passes round B and on to the front of the headstock over a guide pulley F, which runs loose on a fixed stud, and thence back to the rim pulley, being guided thereto by the jockey pulley A. Needless to say, such a long length of rope (it is generally a double or treble rope) stretches, so the pulley F is carried in a guide that permits of adjustment so that the band is kept at the right tension. It is to be noted, also, that the rope drive for the tin drum is an elastic one, that is, it stretches and can slip.

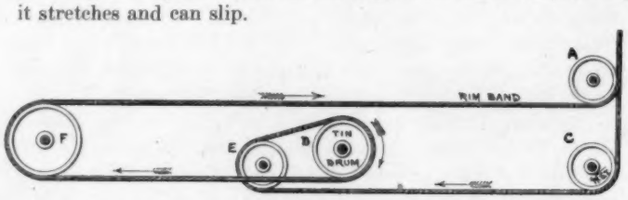


FIG. 2.

An instance of a straightforward rope drive is seen in Fig. 1, where the drawing-up and backing-off shaft is driven from the center shaft. It is seen clearly in Figs. 3 and 4. This is noticeable for the method adopted in tightening the band as it becomes slack, the pulley G, in Fig. 3, being provided for this purpose.

Another interesting method of driving is illustrated in Figs. 1 and 4. The mule carriage is drawn in by a rope from the counter shaft driving the pulley (a) in Fig. 1, and from this

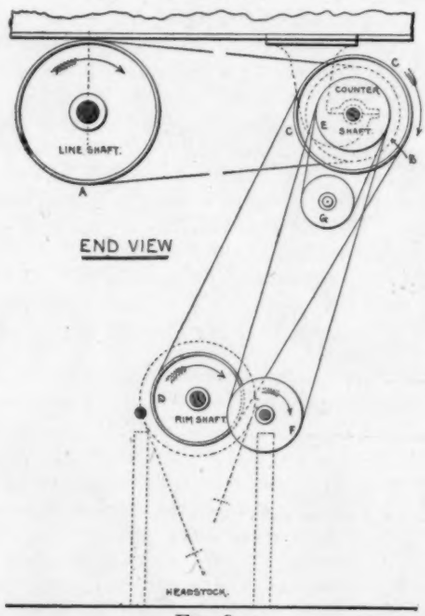


FIG. 3.

point bevel wheels are used for operating the scroll shaft. Since the carriage has a to and fro motion, the direction of the scroll shaft must be reversed. To permit of this being done a clutch is introduced at M and N, Fig. 4. A similar device is also applied on the headstock or rim shaft to allow the rim pulley to be reversed for "backing off." (See Fig. 1.) It must be borne in mind that the putting in and out of these clutches require the most careful adjustment so as to come into action at the precise moment required.

We now come to a most peculiar drive. Even the casual reader will know that a mule carriage is a heavy and ponderous

thing, and requires some power to move it. It stops and starts probably eight times a minute, so that a considerable strain is thrown on the wheels and ropes through which it receives its motion.

To effect a gradual start and a gradual finish to the motion of the carriage is the object for which we aim, and this is brought about by the use of scroll pulleys, that is, pulleys with varying diameters. A good sketch of the arrangement is given in Fig. 4, and a supplementary drawing is shown in Figs. 5 and 6. One sketch (Fig. 5) shows the carriage being drawn in, whilst Fig. 7 shows how the scroll draws the carriage out. Each sketch

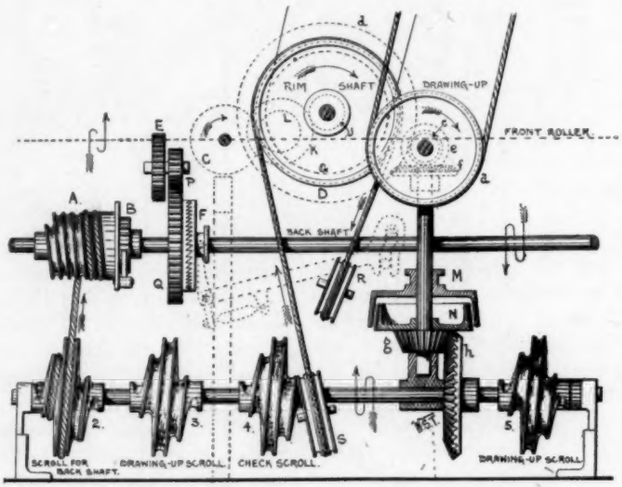


FIG. 4.

gives a very clear idea of the varying motion given to the carriage.

In conclusion, it may be mentioned that a most remarkable specimen of driving is to be found in the mule, viz., the quadrant drive. We have mentioned that the spindles are driven from the rim shaft during the spinning or twisting process when the carriage runs out.

The winding of the spun yarn on the spindle is performed through the quadrant when the carriage runs in. We obtain during this period an astonishing series of variation of spindle speed as the cop is built up and an interesting study is awaiting the student who settles down to master the principles involved.

FIG. 5.

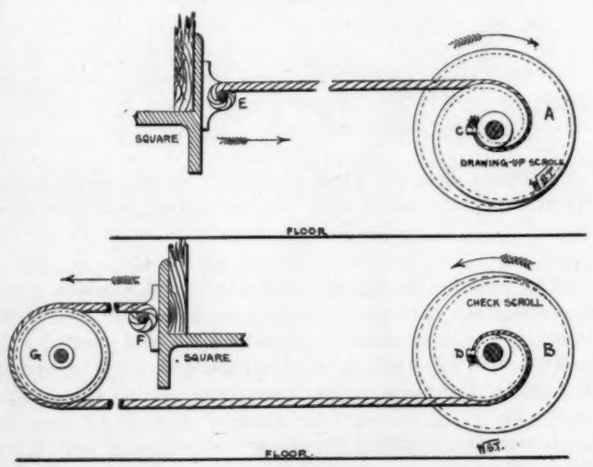


FIG. 6.

Sufficient has been said, though briefly, to show how a study of the driving alone of the self-acting mule presents a series of examples of mechanical actions beautifully adapted for specific purposes; and it will well repay the reader to try to understand this factor before entering upon a study of the more complicated details of the actions of the machine and how they are brought about.

SIZING OR FINISHING MEDIA.

An Austrian chemist has recently devised a method of preparing sizing or finishing media, produced from substances containing starch and gluten, suitable for various finishing requirements. The characteristic feature of the method employed consists in that starchy or glutinous substances or an artificial mixture of starch and gluten, preferably rice rich in gluten or ordinary rice mixed with gluten, is first moderately steamed so as to loosen the tissue and then mixed with substances having an alkaline reaction, so as to separate the proteins, and finally mixed with a solution of an organic acid. The product is then dried at a temperature under 100° centigrade and the dried product ground to powder. For separating the proteins, ammonium carbonate is preferably used; but other alkaline substances may be employed, such as soda, lime, chalk, barites. As the organic acid, lactic acid has been found to be preferable.

The process of manufacture is as follows: A glutinous rice or ordinary rice mixed with gluten, so that the product contains eight per cent of gluten, is moderately steamed so as to loosen the tissue. The product is then allowed to stand until it is completely cold, when it is mixed with a fifty-per-cent solution of ammonium carbonate with a view to separating out the proteins, (one part ammonium carbonate to twenty parts of the protein contained. After being allowed to stand for one hour the rice thus disintegrated is mixed with a solution of lactic acid(two parts anhydrous acid to eight parts protein) and thoroughly stirred together until the mass is perfectly homogeneous. The amount of water used in the solution may be from fifty to one hundred parts. The mixture is then dried at a temperature not exceeding 100° degrees centigrade. If desired, suitable ventilation may be provided for removing the arising vapors, and the product is finally ground and passed through a sieve.

Instead of adding lactic acid to the product it can be produced in the rice-powder itself by means of lactic ferments. If vinegar is used instead of the lactic acid, it can be produced in the rice by any suitable process of fermentation.

Lye used for bleaching is incomparably more active, penetrating and powerful in removing oily matter if it be deprived of fixed air by the addition of lime.

Prints exceedingly fast to light can be produced by incorporating to diamine pastes a certain amount of alkaline copper solution, moist steaming, rinsing, and drying.

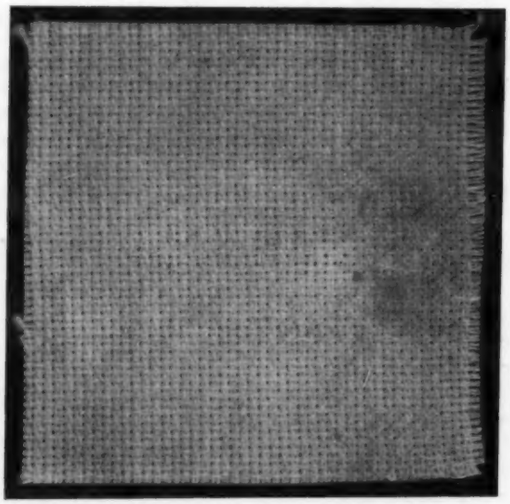
The process of mordanting wool with metallic salts is currently assumed as founded on the mechanical deposition merely of dissociated metalic hydrate upon the fibre.

If a business concern had a case before the court of last resort involving their interests they would employ the best lawyer they knew, regardless of expense, to find the evidence and present it in the most forceful, convincing form.

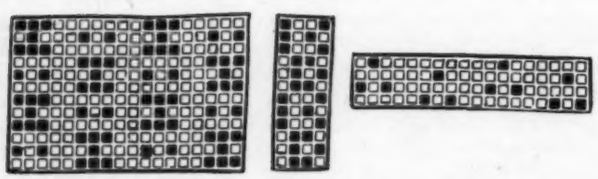
Now, your goods are going before the court of last resort—the market. Why not hire the best men you know, regardless of expense, the best advertising writer and the best printer—the men who bear the same relation to the market as th lawyer to a court.

MOCK LENO.

A style of cloth has come upon the European market like the one herewith represented, technically known as "mock leno" cloth. As will be seen, the cloth is very open, and, therefore, is cool for wearing, suitable for Southern or warm climates. The yarn of which the cloth is made is No. 16 for warp, and No. 12 for weft. Between every three ends there is an empty dent,



MOCK LENO.



DESIGN. TIE UP. DRAFT.

hence there are three ends in a dent and nothing in the next. The design, draft, and tie up is herewith shown, two repeats of the design being given, both warp and weft ways of the pattern, repeating on six ends (four dents) and six picks. The empty spaces on the full design show where the empty dents should be left.

THE BEGINNING OF LINTERS.

The short fiber of cotton remaining on cotton seed after ginning and subsequently removed, and entering trade under the name of "linters," was at first very different from this class of cotton at the present time. It was taken from cotton seed that had been poorly ginned, either because of imperfect gins or of imperfect ginning, and the fiber was of sufficient length to be spun and, in fact, was made into yarn by various manufacturers. This cotton was used by manufacturers of knit goods and also of blankets and of coarse yarns. This was in the days before cotton-seed mills. The cotton now known as "linters" is a by-product of the cotton-seed oil business and consists of all of the lint cleaned from the seed after ginning with a staple too short for spinning.

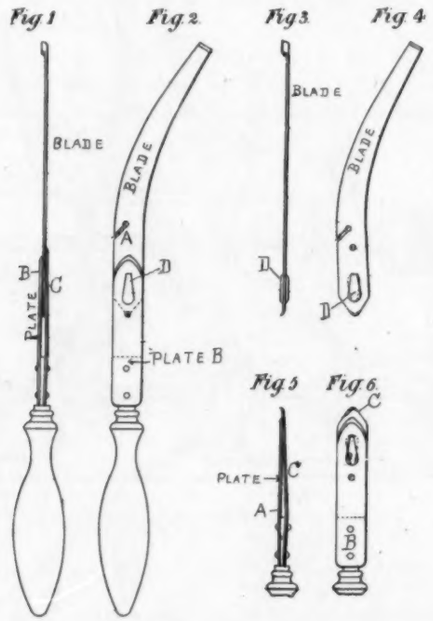
The first exportation of linters, it is believed, was made by the S. Blaisdell, Jr., Co., of Chicopee, Mass., about 1870 to 1872, and the first shipments were made to England, followed a little later by shipments to Germany and France.

Mercerised cotton is cotton yarn that has had a certain amount of lustre imparted to it so as to resemble silk to some extent.

HOOK FOR DRAWING IN WARP-THREADS.

The acompanying illustration of a hook for drawing in warp-threads may be interesting and suggestive to some of our readers, as presenting something novel and perhaps practical. The hook is intended especially for drawing the threads through the reed, and consists in a construction whereby the hook advances gradually and automatically along the reed during the operation of drawing the warp-threads through the successive splits.

Figs. 1 and 2 illustrates, respectively, in plan and in side elevation, the hook, while Figs. 3, 4, 5 and 6 are detailed views showing the blade of the hook and the handle portion attached.



The hook is used in the following manner:—The blade is passed through a split in the reed and a warp-thread engaged by the notch A. While passing the blade through the split, the adjacent bar in the reed is forced between the plate B and the blade passes over the projection D to the space between the plates BC at the rear of the blade. During the return of the blade to draw the thread through the split the bar of the reed is freed from the plates by passing out between the blade and the plate C, the bar thus passing from the one side of the blade to the other side, while the hook advances from the one split to the next in order. In this manner the engagement of each successive split is insured, and the hook advanced automatically along the reed. The bent portion o fthe plate C not only serves to prevent the reed bar which has passed out between it and the blade re-entering, but guides the hook to the next bar when the hook is again pushed forward to engage another thread.

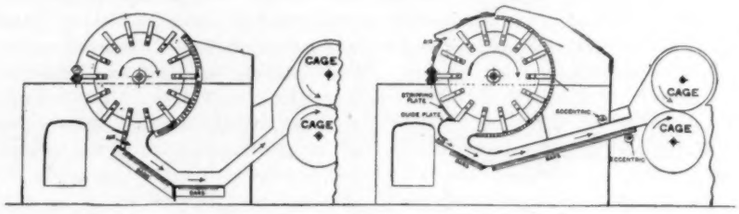
Thirty-six days may advantageously be spent over the bleaching of linen cloth, cotton cloth may be bleached as follows in six days:

The tendency in Egypt has been toward planting cotton closer together in order to obtain more plants per acre. This, however, had been found detrimental to good results. The problem now is to find a way of increasing the crop to meet the demands and at the same time keep up the quality.

Iron stains are often found upon white goods, having been produced by the wet yarn or cloth coming into contact with iron. They may be removed with salts of lemon or muriatic acid.

A COTTON OPENER.

We illustrate a cotton opener that has recently been brought out by one of the machine shops of England, that may possess some points of interest to American readers, differing in some essential features from the openers in general use in the factories of this country. This English opener is known as the Buckley type, which was invented by Edward Buckley more than thirty-two years ago, and with which his name has been identified ever since. It is in extensive use in the cotton spinning districts of Lancashire.



BUCKLEY OPENER.

At one time this opener was considered to be suitable only for the treatment of the higher grades of cotton, and for this reason preference was given to the "Crighton", as meeting more nearly the ordinary requirements of the spinning trade. Of late, however, the Buckley type of opener has been adapted to the medium and lower qualities of cotton, the same as other machines of its class. In this respect, this opener has been greatly assisted by the use of the hopper bale breaker, by which the cotton is taken from the bale and worked up and delivered to the opener in a condition to be readily handled. It is said that this machine, when worked in combination with a beater and lap machine, yields remarkably good results.

The accompanying illustrations show the opener as formerly constructed and as now arranged. As will be observed, the earlier machine has the circular grid surrounding the cylinder about one-third of its circumference, finishing at a point slightly to the right of the center of the cylinder. In the improved type as will be seen, the stripping plate is fixed higher, and the bars fall away toward a curved guide plate instead of in a direct circle as in the old arrangement. This, it is stated, prevents the possibility of the cotton passing round the cylinder more than once. The hinged curved guide plate, shown in the right-hand illustration, by means of which the cotton can be guided on to the lower series of bars, can be set in varying positions so as to allow more air to pass to regulate the passage of the cotton up the cages. It will be seen that a long series of bars placed on an incline and leading up to the cages are employed. The latter is so arranged that the bars and covering can be raised or lowered by eccentrics into any desired position. By this arrangement it is possible to direct the cotton evenly to both cages or to deliver more cotton to either cage at will. Owing to the bars being placed on an incline the cotton is more effectively cleaned.

The chief advantage of the new arrangement is the admirable and effective cleaning which takes place.

Twelve years ago the first electric motor-driven textile mill was put in operation in a southern cotton mill, aggregating about 700 H. P. Today there are in the United States alone over 180 electrically operated textile mills, with one system of induction motors having a total capacity of 140,000 horse-power. When it is considered that this latter figure represents ⅔ of the total electrical horse-power installed in textile mills in the United States the increase in the adaption of this flexible system of drive is remarkable.

COTTON MILL MACHINE SHOP SUGGESTIONS.

Varied machine shop experience in different parts of the country is something that does not fall to the lot of every mechanic, but those who have had an experience of that kind, have no doubt noticed as has the writer, that ways of doing work and shop appliances which are very familiar to shop men in one part of the country are entirely unheard of in another. It is my intention to describe in this article some of the many kinks and tools that I remember seeing during the varied experience referred to, and while some of them may have been known for years to some readers, the latter must remember that there are perhaps others who have not had the same advantages along these lines which they themselves received.

In turning up shafts and center bars from square stock in the lathe, particularly on long, slender work, it becomes absolutely necessary to support the work with a steady-rest to keep it from springing and chattering. In order to do this, some provision must be made to eliminate the square corners. This is done by using a thimble, Fig. 1. This is merely a cast iron sleeve turned up on the outside, about half an inch thick and of a diameter suitable for the stock. These are generally made from 6 to 8 inches long and have four long set screws in each end placed 90 degrees apart. To use the thimble, the shaft is first centered and straightened. Then the approximate location for the steady-rest is found and marked. Slip the thimble over the shaft to this position and set up the screws all around. Then take a piece of chalk and by rotating the lathe in the ordinary manner true up both ends of the thimble by setting the adjusting screws until it is perfectly true, when the steady-rest may be applied in the usual manner. I have been in shops where this job was done by using a sleeve coupling from the nearest size of pipe and adjusting it with wooden wedges driven in the ends, but it is not a satisfactory job and could not be depended upon for true work.

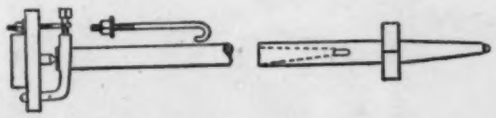
FIGS. 1 AND 2. THE THIMBLE AND HOLD-BACK CLAMP.

Occasionally there will be a job of drilling or boring in the end of a piece of work just turned in the lathe. A time and labor-saver for this kind of work is the hold back clamp or hook. This is applied to the faceplate end of the work to keep it on the live center, while the other end of the work is held in the steady-rest.

The clamp is fastened to the face-plate with two bolts, while the hook, which is much the handier tool of the two, hooks over the set screw of the driving dog and passes back through the slot in the faceplate, being held in position by a nut and washer. Care must be taken not to screw too tightly on the hook nut, because with slender work it would spring it out of true owing to the one-sided pull. The hold-back clamp is shown in Fig. 2, while Fig. 3 shows the hold-back hook and the method of application.

In one manufacturing plant where there were a good many machine screws used in the construction and erection of the tools, it was the custom of the drafting room to designate screws of

different diameters and threads on the drawing by letter, and to simplify matters in the machine shop and avoid mistakes the tool room was provided with wooden blocks about 4 inches square, with a number of holes bored in the top and with the letter corresponding with the drawing stamped on the side. In the holes in the block were the following tools, all for that particular size of screw; tap drill, body drill, counter-sink, counterbore, two taps and a tap wrench. Thus an erecting machinist would find by referring to the drawing that certain parts were to be fastened on with "D" screws. He does not know the size or number of threads and he does not have to know the size for his tap drill, for all that is required of him is to go or send to the tool room for the "D" block and everything he needs is right there.



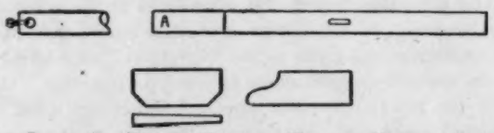
FIGS. 3 AND 4. HOLD-BACK HOOK, AND DRILL SOCKET FOR TAILSTOCK.

A very convenient tool for lathe work is a Morse No. 3 taper shank drill socket turned up to fit the tailstock center of the lathe, thus enabling one to use twist drills in a quick and convenient manner. Should this tool have a tendency to slip or turn in the spindle under the cut, it may have a square collar shrunk on near the center, so that it may be held with a wrench, as in Fig. 4. Another rig I have seen along these same lines was designed to utilize the carriage feed. Its general outline is shown in Fig. 5. This is a casting machined to fit the cross slide of the carriage in place of the tool post, and fastens with one bolt. The socket end is bored and reamed to some number of Morse taper. This is not a very good rig for drilling, but it is handy for boring small holes and using a twist drill as a boring tool. This is not to be recommended as a regular practice, for with the drill cutting on one lip only it will require frequent grinding.

FIGS. 5 AND 6. SOCKETS FOR BORING BARS, FITTED TO THE CROSS-SLIDE.

Boring tools or bars for long holes, when supported at one end only as is often done in lathe work, are perhaps the most unsatisfactory tool the latheman has to contend with, as there is nothing quite so wearing on a man's nerves as to have his boring tool on a hurry up job start in with a chip of a quarter of an inch and run out into the scale in the course of three or four inches of boring, owing to the tool forcing round in the tool post. Many are the rigs that have been devised to overcome this trouble by the ingenious men whose tempers are often sorely tried. Perhaps the most common of the permanent rigs is that shown in Fig. 6, which is a clamp socket bolted to the cross slide block. This is bored to take the largest size of boring tool or bar that is necessary to be used in that lathe, and the smaller sizes are used by inserting split bushings into the socket to reduce the bore to the size of the bareused. The bars are generally short pieces of cold rolld shaft with a hole bored near one end for the cutter and a set screw tapped into the end of the bar and opening into the hole, as in Fig. 7. The principal advantages of this bar is its solid support at one end and the ease with which it may be adjusted for length of hole, while its principal disadvantage is the lack of support at the cutting end.

Another bar, which partly overcomes this disadvantage, but which can only be used in hollow spindle lathes, is shown in Fig. 8. This bar is held in the same clamp holder as the other bar, but the cutter slot is about at the center of the bar, as shown, while the end *A* is made an easy fit to the bore of the hollow spindle. The center line of the bar is easily adjusted by having a small center hole in the back end and setting it by the dead center. Use cutters similar to those shown in Fig. 9, the single end cutter for roughing and the double end cutter for finishing, all cutters being held by the wedge shown with the cutters. I have bored a rough cast iron bushing 16 inches long, with a 2¼-inch core, to 3 inches diameter in 50 minutes actual running time, with one of these bars, and had a smooth, straight hole. I made two roughing cuts and one finishing cut and used the coarsest feed which the 28-inch lathe afforded on all the cuts. The disadvantages of this bar are, that the cored hole in the work must exceed the diameter of the bore of the hollow spindle, unless the bar be inserted from the back end of the hole, and also the fact that it cannot be used on lathes without the hollow spindle. I have, however, seen many successful jobs turned out with these bars in one-tenth the time ordinarily used for this work.



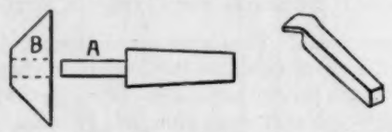
FIGS. 7 AND 8. BORING BAR FOR HOLLOW SPINDLE LATHE.
FIG. 9. FORMS OF CUTTER USED IN THE BORING BAR.

Another common kink in some sections, to prevent the tool from chattering the work, or screaming in turning hard pulleys, is to clamp a monkey-wrench on the back end of the tool. Sometimes it is more convenient when working steam pipe up to 4 inches in diameter in the lathe to use pipe centers. I have seen many varieties of these, but of them all I think the most satisfactory ones were made as shown in Fig. 10. As the part *B* worked on the spindle *A*, it was necessary to keep it well oiled. Spindle *A* was made of tool steel, and *B*, of cast iron. Another common tool is the square center or center-truing tool, Fig. 11. In doing planer work it is often necessary to pack under the work in places where it does not bear on the table, in order to keep the work from springing down under the pressure of the tool. A good handy tool for this work may be easily made by cutting off some pieces of 1, 1½, and 2-inch square iron in the hack saw, about 2 inches ling. Drill and tap these for a ½-inch set screw and keep them in a handy place where they will not get battered-up. Fig. 12 shows the finished block.

Always cut off the sides of the planer bolt heads, as in Fig. 13, as they are much more convenient to put in and take out, and they may be inserted anywhere in the tee slot and only local cleaning is necessary. Then many times one desires to add another clamp to the work in a place where it would be necessary to shift the work to get the clamp where it is wanted, which trouble is saved by this means.

Once I had a lot of steel slasher cylinder heads to turn on a boring mill and as they were just sheared off approximately round, there were no two alike in shape. There were twenty-four heads in the lot and each head had to have a 5-inch hole in the center to admit the shoulder of the journal bearing, and eight 1-inch holes for brace rods located a little more than half way between the center and the circumference. These heads were about 72 inches in diameter and 5/16 of an inch thick. I first laid off the holes on one head and drilled the 1-inch holes on the radial drill. The center hole I drilled ¾ of an inch. This head was then used as a template for drilling the other holes. Then I made the tool illustrated in Fig. 14 to cut the holes to 5 inches, still using the radial drill to bore the holes.

This tool had an inserted cutter that could be varied a little in setting, so that adjustment could be made for size. The ¾-inch guide pin in the center is held true to the center of the heads and very little stock had to be removed to do o good quick job. While this part of the work was in progress, I had a false center made for the boring mill table, as in Fig. 15. This was of cast iron and the shoulder was made 4 inches from the bottom to accommodate some 4-inch parallels already on hand. This center was trued up and bolted to the center of the boring mill table and the whole 24 heads slipped on into place, turning each head as it was placed on the mill, so that the 1-inch stay rod holes would come in line. Bolts were then run through the stay rod holes to the tee slots in the table, using the 4-inch parallels under the outside of the heads and false heads on the bolts, as shown in Fig. 16. After everything was ready, tools were set in both heads of the mill and quick work was made of the turning job, while the cylinder heads were necessarily all the same size.

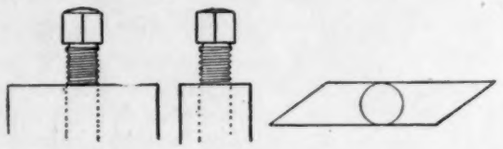


FIGS. 10 AND 11. PIPE CENTER, AND CENTER-TRUING TOOL.

In the regular manufacturing machine shop, the keyseating for the whole shop is generally done on special machines, but in the small and oftentimes isolated repair shop, special machines are almost wholly unknown and the ingenuity of the foreman or the men is often taxed to find a quick, cheap and more or less convenient way to do the job, that will be accurate enough for the work in hand. In cotton mill work large numbers of change gears are made for the spinning room and as these work on spindles fitted with pin keys about ⅛ or 3/16 of an inch wide, and as the diameter of the hole in the gear is seldom over ¾ of an inch, a broach like Fig. 17 will give a satisfactory job. These gears are about ⅞ of an inch thick and after finishing and cutting on the gear cutter, are ready for keyseating.

Orders for gears are generally in large lots and it will be found cheaper in the end to use one of the gears for a drill jig on each job, rather than litter up the tool room with a multiplicity of steel jigs, whose size will vary so little as to make the right one often difficult to find. Moreover the wear on a cast iron jig for one or two hundred gears will not be sufficient to cause any trouble. As soon as the first batch of gears come off the gear cutter, select one and lay out a small hole with the prick punch, in such a position that when the stock between it and the central hole in the gear is broached out, the keyway will be of sufficient depth to slip easily over the pin keys on the machine. Then select a twist drill of the same size as the broach and drill this small hole clear through the gear. Fig. 18 shows how the gear will then look. Using this gear as a jig, the other gears in the lot may be quickly and accurately drilled. It is sometimes more convenient to do the drilling before the gears are cut, but this may be arranged by the individual operator. After drilling, place the broach in position and a few sharp blows with the hammer will serve to cut out the remaining stock and the job is ready for use.

The writer once had a small gear to fit up for a small well drilling machine. The gear was a rough cast one about 10 inches in diameter and 4-inch face, with a long hub on one side grooved for a yoke to use in slipping it in and out of gear. As this gear was the pinion that operated the drilling cranks it was subjected to severe shocks at each revolution of the machine and to secure the necessary rigidity on the job two ¾-inch steel feather keys were fitted in the shaft in diametrically opposite directions. Fig. 19 shows this gear, which was bored three inches. Where the trouble came in was in cutting the keyways, which were 8½ inches long, ¾ of an inch wide and 13/32 of an inch deep. The only tool in the shop was a 28-inch lathe. Chucking the gear with the hub side out, the groove was turned in the hub, the hole bored to size and the end of the hub faced off.

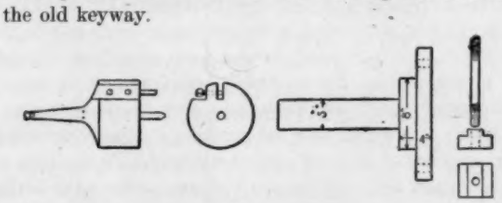


FIGS. 12 AND 13. VIEWS OF THE PLANER BLOCKS.

Running the carriage back out of the way and locking the cone with the backgears, a central mark was scribed across the chalked face with a surface gage, the gage resting on the lathe slides. Removing the cutter from the boring tool or bar, a special cutter was made and fitted suitable for cutting a ¾-inch keyseat. The bar was adjusted in the clamp socket so that the center of the cutter came right with the surface gage, and clamped fast. This cutter was then drawn back and forth through the work by hand, feeding with the cross slide and taking care not to break the rack teeth by an over strain. When one side was the required depth, the gear was turned over with the chuck, first unlocking the backgear, the opposite line located with the surface gage and the operation of cutting repeated. This gave a good reliable job in much quicker time than would have been the case had the keyseats been chipped, and much more accurate.

This same scheme may be adopted for outside as well as inside keyseats. In repairing the built up crankshaft of a 10x12-inch double engine, on which the crankpin had broken and cracked one disk, the following plan was used. The cracked disk was enlarged with paper bands glued on, to make sufficient allowance for finishing and a new one cast.

This was bored to size and one side faced off. The crankpin hole was laid off and drilled ⅛ of an inch small. Then the two disks were forced onto the same arbor, the crankpin holes brought together and the disks clamped to prevent them from slipping out of place. The holes in both disks were then "skimmed" out and a reamer run through. The hole in the old disk already had a 5/16 of an inch keyseat in it and rolling this hole to the front of the lathe and clamping it there, a 5/16-inch keyway cutter was placed in an inserted cutter boring tool and lined up with the old keyway.



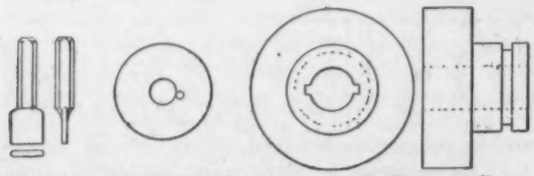
FIGS. 14 AND 15. TOOL WITH INSERTED CUTTER, AND THE FALSE CENTER.

FIG. 16. STAY ROD AND TEE-SLOT NUT.

The keyseat in the new disk was then cut and the old one scraped a little deeper, by running the carriage back and forth as previously described. A short plug was then prepared that would just drive snugly into the reamed holes and after this was in place, the clamps were removed and the outside of the disks turned and faced. The plug and arbor being removed, the ¾-inch keyseat for the main shaft was chipped and both pieces of the shaft forced into their respective disks and keyed.

The crankpin was then cut off and turned and after all fits were made, the keyseats were scribed off on the ends, the pin removed from the lathe for drilling and then replaced for cutting the keyseats, which was done with a specially forged tool held in the tool post, while the pin was held securely on the centers.

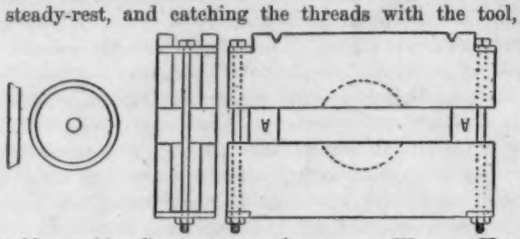
When the disks were driven up on the pin and keyed and the ends peaned down in position, the whole was placed in the bearings and rotated. If the disks were out of truth, it was so small an amount that it would not be detected by holding chalk to the face and sides. Any one who has had experience with cranks of this description will appreciate the difficulties that the slightest error of alignment will cause.



FIGS. 17 AND 18. THE BROACH AND THE DRILLED GEAR.
FIG. 19. PINION CONTAINING TWO KEYSEATS.

The new boilers called for a new 12-inch header and the pipe had been ordered cut to the desired lengths, while the flanges, which were of extra heavy variety, were to be cast at the local foundry and finished in the repair shop. They were all finished nicely to fit a standard size plug before the pipe arrived. When it did arrive, it was found that the threads had been cut for standard fittings only and were therefore about ¾ of an inch too short to allow the extra long threads of the heavy flanges to screw to place. Moreover, the dies must have been dull when the pipe was cut, as the threads were shallow and round in the bottom. The steady-rest of the 28-inch lathe would just take 8-inch pipe and no more, so a wooden steady-rest was made and clamped to the guides. This was made of 2-inch plank set on edge with distance blocks between them. The bottom edge was grooved to fit the Vs and the top securely bolted to the bottom with distance pieces between. Fig. 20 will give a general idea of the construction.

The hole shown by the dotted lines was bored with a boring bar on centers to the right size for the 12-inch pipe, adjustment for wear being made by planing off the wood blocks *A A* until the proper degree of firmness was secured. One end of the pipe was then trued in the chuck, the other end being in this improvised steady-rest, and catching the threads with the tool, the



FIGS. 20 AND 21. SHOWING THE CLAMP AND WOODEN HEAD.

cutting process began. Then arose a new trouble. As the pipe was threaded at both ends, the threads in the chuck had been protected from the jaws by using strips of copper under the jaws, but the pipe would work away from this and make the cutting tool cross the threads. The jaws were then tried on the inside of the pipe with similar results. A long ⅝-inch rod was then threaded and run through the hollow spindle and pipe, and through the wood head, Fig. 21, which was placed in the end of the pipe. Washers and double check-nuts placed on the ends of this rod and made up tight, securely held the pipe from further slipping. The tailstock had been removed, because of the length of the pipe and therefore could not be used to assist in this work.

KNITTING

KNITTING AND KNITTING MACHINERY.

Details Play an Important Part.—Good Winding An Essential Factor.

BY OLD KNITTER.

From time to time much has been written about knitting machinery. Details are what concerns the manufacture of knitted goods, conditions connected with and surrounding which are varied indeed. While new devices and ideas are constantly coming to notice, the fundamental principles of knitting are much the same today as when our grandmothers made one perfect stitch at a time; and the machine that is constructed so as to keep nearest to the one perfect stitch idea, is the best working machine; and the more rapidly this can be done the better, to meet the present day quantity requirements.

A new machine properly made, set up, and well adjusted, having clean and strong, even yarn, will make good work, and will easily turn off full production, but these are conditions only occasionally occuring.

It is up to the knitter to take carefully into account what he is going to make, of what stock, and what is the machine that will best meet his requirements. Here is where the experienced knitter's judgment comes into advantage, and it may also be said that the same argument applies with equal force to each department in the manufacture of knitted goods, such as winding, spinning, scouring and finishing.

In these days of keen competition, when material, raw stock and labor are soaring to what must be close to the limit, there is not that margin in manufacture there was not many years ago. Hence no detail can be lost sight of without some loss resulting. Details play an important part. The great object is to get all the stock possible into salable goods. To accomplish this, waste and seconds are to be avoided as much as possible, and in no place more than in the knitting room. Can these items be controlled? It would be in order I to say that the first and most essential point is good winding. It is often said that a bobbin well wound is half knit, and any knitter of experience will bear out this statement. A carefully adjusted winding machine, and knots properly tied (the square knot is best), is requisite to good knitting on all kinds of stock; and it is surprising how often this point is overlooked, or rather allowed to take care of itself.

With the winding going right and done with the least possible waste, then comes the knitting machine, which should be properly adjusted, usually looked after by the boss-knitter. The principal points to be looked after in adjusting are:

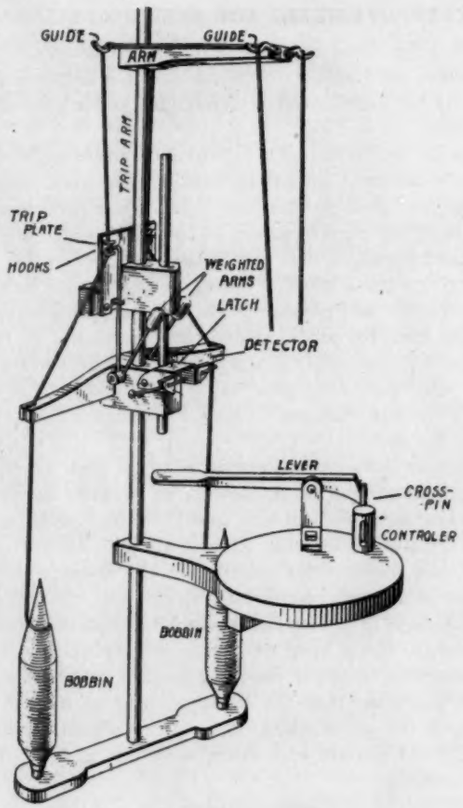
1. To form the stitches clearly, one at a time, and perfectly, with as little strain on the yarn as can be, both in the forming and casting off, with no tension on the yarn that can be done without. Care should also be taken to avoid indentation on the cloth at the take-up. Next, the width of the cloth should be knit so as to cut to the best advantage.

These are the general points to be observed. Varying conditions of stock and goods required, will all bring about their corresponding variations in adjustment which will appeal to the judgment of the man in charge. Minute details are of great importance in knitting, and he who can see and master them gets the best general results.

The dam recently constructed at Assouan has done much to increase the water supply and prevent drought. This, however, is not sufficient for Egypt's requirements, and further extensive works are now contemplated.

AUTOMATIC STOP-MOTION FOR KNITTING-MACHINES.

We illustrate, herewith, an automatic stop-motion for ribbed knitting-machines, relating particularly to yarn controllers. The object is to provide an efficient mechanism by means of which the machine will be automatically stopped when the yarn becomes knotted or tangled, or when it is stretched too tight, means being provided whereby sufficient slack will be given the tangled or knotted yarn to prevent it from breaking and to prevent the goods from running out of the machine before the latter is brought to a standstill.

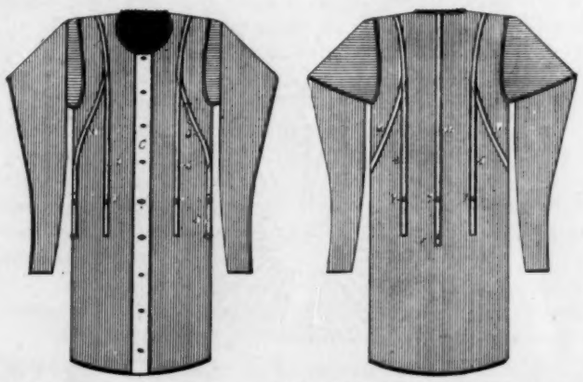


The illustration of the invention is as follows: The yarn passes from the bobbins forwardly through the detectors, then upwardly and inwardly through hooks and over the bent upper end of a trip arm, then upwardly over guides on the ends of a arm, and then downwardly to the machine. The yarn in passing from detectors to guides on the adjacent end of arm travels in an angular direction, the latter being caused by trip releasing plates, and when a knot tangle or other enlargement upon the yarn reaches the detector the portion of the yarn between the latter and the machine becomes stretched so that the portion between the detector and guide becomes straightened, and swings one of the trip releasing plates outwardly. When one of the latter is thus actuated, its trip device is freed by the yarn, and the weighted arm descends and forces a latch downwardly against the tension of its actuated spring. When the latch is thus swung downwardly, it disengages a notch in a drop weight, and the latter is allowed to drop upon a level. The movement imparted to the level by the drop weight causes one of its ends to move a crosspin and hence rotate the controller to stop the machine. This mechanism will also antomatically stop the rib machine when the yarn is entirely unwound from the cone or bobbin, that is, when the end of the yarn is reached.

KNITTED UNDERGARMENT.

The accompanying illustrations shows a knitted undergarment. Fig. 1 being the front view, and Fig. 2 the rear view. Heretofore waists or packets of cloth, muslin, or like woven and relatively inelastic material, have been provided with tapes, bands or straps of the character like those here shown, but such waists or jackets must be worn in connection with a knitted underskirt and the combination of the two garments is, in many cases, so bulky as to be uncomfortable to the wearer, especially if the undergarment is composed of heavy yarn or is provided with a fleeced lining.

The scheme here presented, provides a single garment combining the functions of the two garments, the skirt portion of it retaining the full natural elasticity of the ribbed knitted web of



which the garment is composed, but the upper or body portion of the garment being relatively stiffened by the tapes or bands secured thereto, so that it affords proper support for the garments suspended from it.

The object of the present plan is to furnish a knitted undergarment which, as to its skirt portion, will be fully as elastic as an ordinary knitted underskirt, but as to its body portion will be somewhat less elastic, whereby the body portion will be available for the support of a skirt or for the attachment of hose supporters or the like, and the use of a special waist or jacket for such purposes will be unnecessary.

A NATIONAL KNIT GOODS ASSOCIATION.

The American Knit Goods Manufacturers' Association was organized in Reading, Pa., on May 4th, its scope embracing all manufacturers of knit goods, except hosiery. The fact that the officers at the time of organization were all located in Pennsylvania was not intended to mean that this is an association peculiar to that State alone, but is intended to embrace all manufacturers in the country. The officers elected were as follows: President, J. C. Lautenbacher, Enterprise Knitting Mills, Schuylkill Haven, Pa.; first vice president, J. Clarence Parsons, Parsons & Baker, Phœnixville, Pa.; second vice president, T. J. Whittaker, Hazel Knitting Mill Co., Hazleton, Pa.; secretary and treasurer, C. B. Carter, Room 683 Drexel Building, Philadelphia, Pa.

The objects of the association, as set forth in its constitution and by-laws, are the promotion of more intimate social relations and more friendly feeling among the members, and to encourage and stimulate the commercial interests of knit goods manufacturers of the United States in every way possible; to foster and develop plans and conditions having for their purpose the correction of trade abuses and the advancement of such legislation as will prove mutually beneficial to all concerned.

The bleaching of linens is a singularly healthy employment. It constitutes an important industry in Ireland, which possesses the best climate in the world for bleaching.

A KNITTING MACHINE WITH TWO SETS OF NEEDLES.

There has recently been invented a knitting machine in which are combined two sets of needles—one set comprising a lesser number than the other—which may be comprehended by

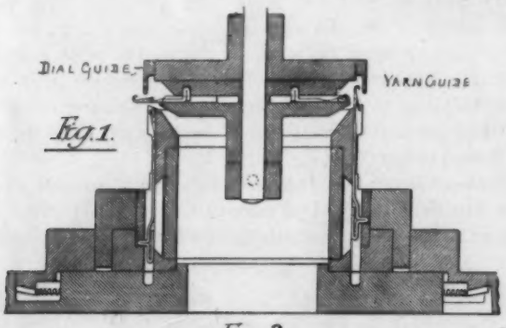
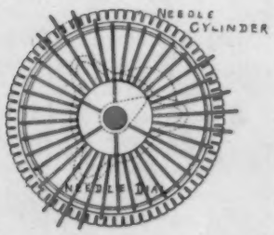


Fig. 1.

Fig. 2



an examination of the accompanying illustrations. Fig. 1 is a sectional view of a part of a knitting machine illustrating the arrangement, and Fig. 2 is a plan view of the needle dial and needle cylinder.

A series of yarn guides are employed for feeding yarn to the cylinder needles and a lesser number of yarn guides are employed for feeding yarn to the dial needles, there being in the present instance, six cylinder yarn guides and three dial yarn guides.

Owing to the fewer number of dial yarn guides and the fewer number of sets of dial plate cams as compared with the yarn guides and cams of the cylinder, the fabric formed upon the dial needles will have a correspondingly lesser number of courses of stitches and it will also have a lesser number of wales of stitches, for, as will be observed on reference to Fig. 2, the dial has a lesser number of needle grooves than the cylinder, having in the present instance only half as many, hence the fabric produced upon the machine shown and described will have in one web, namely that produced upon the dial needles, only half as many wales of stitches and half as many courses of stitches as the fabric produced upon the cylinder needles.

By reason of this construction coarse yarns can be used in connection with the dial needles and yarn guides, and such yarns can be composed of linen or other fibre possessing much less flexibility than cotton or wool, thus permitting of the use, for one of the webs of the fabric, of yarns of a character which cannot be used in machines of fine gauge.

YARN MEASURING AND FEEDING DEVICE.

A device for measuring and feeding yarn from a bobbin or other suitable yarn holder, to the needles of a knitting machine has recently been introduced to manufacturers for their approval and adoption.

The object of the device is to provide a means which may be adapted to different styles of knitting machines, employing either spring or latch needles, and which is particularly adapted to measure off the yarn by means of feed gears which are so constructed and arranged that one of the gears is movable toward and away from the other, a spring acting to move this gear toward the other, and positive means being supplied to move the same away from the other, whereby any inequality in the yarn or bunches will not result in damage to the yarn for the reason that the spring-actuated gear will yield slightly to allow any inequality or said bunches to pass between the gears without injury to the yarn.

The advantage secured by this device is that the length of loop required by each of the needles to perform its completed stitch can be measured off to a nicety and different lengths of stitches may also be measured. The strain upon the yarn when it is being laid between the needles by the stitch wheel or its equivalent on a spring needle machine, or when it is being drawn from the bobbin in a latch needle machine is almost entirely removed and the strain upon the yarn necessary to draw it off the bobbin and feed it to the needles from the bobbin is taken by the feed gears, so that the latch needles, in a latch needle machine, or the stitch wheel, in a spring needle machine, are relieved of the tension and strain necessary to draw the same from the bobbin.

It is easy to exaggerate the possibilities of the expansion of our trade in cotton textiles in Asia.

Dyeing, Bleaching and Finishing

CALICO PRINTING.

Calico Printing in England.—Introduced Into Lancashire in 1764.—Robert Peel, a Pioneer.—Legal Restrictions Removed in 1774.—Four Methods of Printing—Early Block Printing in Rhode Island.

BY HENRY G. KITTREDGE.

II.

The printing business was almost exclusively confined to London, Eng., and its vicinity, till about the middle of the eighteenth century, when it began to decline there, because of the disadvantages of its situation, in its remoteness from the principal seat of cotton manufacturing in the north, as well as to the higher cost of labor and fuel, but chiefly because of the superior workmanship of the calico printers of Lancashire, where it was introduced by Messrs. Clayton of the Mosney Works, Bamber Bridge, near Preston, in 1764. The Claytons were soon followed by Robert Peel, grandfather of the celebrated statesman Sir Robert Peel, at a place called Brookside, near Blackburn, and from that time for the next half century the history of calico printing in England is closely identified with the Peel family.

Robert Peel made his first attempts secretly in his own house and the cloth instead of being calendered was ironed by a member of his family, and the pattern was a parsley leaf. His eldest son, Robert, contributed much to the success of the printing, spinning and manufacturing businesses, and in the union of these branches the Peels took a lead in Lancashire, adopting every improvement of value suggested by others, and many that originated with them.

After a prolonged contest between conflicting manufacturing interests, all restrictions upon the printing and wearing of calicos were removed in 1774, which allowed the British calico printing trade to develop in accordance with the natural tendency of the industry and enterprise of the people; but printed calicos were

still subject to a duty of 3½ pence per square yard, which was not removed till 1831. Most of the subsequent improvements in calico printing originated or matured, or were perfected, in Lancashire. Many of these compare in importance with those in cotton spinning and bleaching.

In 1771 and 1772, the calico printing business in Scotland became fairly well established, and adapted itself almost entirely to the printing of handkerchiefs and shawls for the English markets, and for sale in Virginia, Maryland and the West Indies. This class of printing was followed in Scotland nearly to the middle of the nineteenth century, after which other classes of work were taken up more like those about Manchester, England.

There are four methods that have been and are known for printing calicoes—by small wooden blocks on which the pattern is cut or otherwise produced in relief; by larger wooden blocks, also in relief, placed in either two or three planes standing at right angles to each other; by flat copper plates engraved and applied as in ordinary copper-plate engraving, but now little used; and by a system of copper cylinders engraved like the plates in intaglio (incised carving and sunken design), mounted on a frame in which they receive a rotary movement by power.

Before the year 1785, hand-block printing, aided about this time by the flat copper-plate printing press, was the only mode of calico printing. It is impossible to assign the period when the use of the cut wooden block first superseded the oriental method of literally painting the cloth, but the Greeks are known to have printed with blocks cut in relief before the taking of Constantinople. Further than this, it is well known that the Chinese employed block printing long before any species of printing was known in Europe; and the means and processes by which the art is practiced in Asia Minor, Turkey, and indeed in all the countries of the east, clearly prove its oriental origin.

Block printing may now be said to be nearly obslete, with the exception, in some instances, of its application to the printing of silk goods and for particular styles of work on other goods as well, as in certain cases after a piece has been printed with mordants or resists (substances for repelling the dye), and dyed in the madder or indigo styles, further colors have to be superadded in order to complete the design—these are then blocked in by hand.

The hand block was made of sycamore, holly or pear tree wood, backed with deal and furnished with a strong handle of boxwood. The size of the block was about 10 inches long by 5 broad. At the time of its application to the fabric to be printed it was saturated with the desired color, then laid upon the cloth (there being wire points at the corners of the block to enable the workman to apply it with exactness), and struck with an iron mallet. In this way the figure was impressed upon the cloth, one color only being used at a time, and if other colors were required for the pattern it was necessary to repeat the operation with different blocks. By this method a piece of calico 28 yards in length required the application of the block 448 times.

In 1802, an important improvement was made in the construction of blocks, for which the art was indebted to the workmen of London, that of inserting copper wire into the blocks so as to describe the pattern. With the use of these wires the blocks lasted a much longer time, and were very largely adopted. The pattern instead of being cut in relief in the wood was raised on the surface of the plain block by the pieces of copper or, as was sometimes used, brass wire of various thicknesses and forms. These pieces of wire were forced into the wood by a hammer at the traced lines of the configuration; the upper surfaces were then filed flat and polished into one horizontal plane for the sake of equality of impression, presenting a surface which stood out from the wood about an eighth of an inch.

Sometime, not long before 1850, stereotyping was applied to the production of printing blocks. The stereotype plate was made from a model first formed from the pattern about five or six inches in length and from an inch and a half to five inches in width, according to the design. A mold was taken from the model, and from the mold, fixed in a block, copies were produced with antimony metal. When a number of these pieces were prepared their surfaces were filed down, joined together, and mounted on a stout piece of wood to form a printing block.

It is related that, in 1790, Herman Vandausen, a German, commenced the calico printing business at East Greenwich, Rhode Island, with blocks cut by himself. He printed not only India cottons but the coarse cottons woven in families in his neighborhood. Although receiving some encouragement it was found cheaper to import than to print cottons, and in consequence he gave up the business. Some of his blocks and samples of his printed fabrics are in the possession of the historical society at Providence.

It is believed that only five places exist, so far as England is concerned, where block printing is now carried on as an independent process—one near Preston, another near Carlisle, one in Kent, one in Staffordshire, and one near London in the decorative art works of William Morris. It is a handicraft operation requiring much taste and dexterity, but of course too slow for the present age.

To produce more delicate patterns than could be engraved on wood, at the time when printing by hand blocks was the almost only method employed, flat engraved copper-plates were introduced in the neighborhood of London about the year 1770, and the cloth was printed with them in the kind of press used for printing engravings on paper. This method of printing continued in use, but was in time superseded by the copper cylinder, which, in principle, may be regarded as nothing but a simple plate bent into a circular form.

CHEMISTRY OF BLEACHING.

The two principles of bleaching are saponfication and decolorization. The first principle means the removal of all grease, oil, size, etc., from the fibre by means of a caustic alkali which decomposes the fats of such acids at palmitic stearic which with glycerol are held by the cotton fibre in the form of salts.
of salts.

Ofttimes cotton, either in the warps or piece goods, is impregnated with greases, china clay soluble oil and tallow used in the weighting of goods. Not only does alkali saponify the grease but assists in the removal of inorganic material such as megnesium salts, chloride of tin, etc.

Saponification takes place in the boiling, the salts formed by these acids is soap from whence we get the term saponification.

Decolorization takes place in the bleaching process chiefly by the use of bleaching powder which at certain temperatures takes place assisted by the use of some acid such as muriatic or sulphuric acid. The latter is used chiefly owing to its cheapness. With muriatic acid the reaction is as follows:

$$C\,A\,(O\,C\,L)_2 + 2\,H\,C\,L = C\,A\,C\,L_2 + 2\,H\,C\,L\,O$$

$$2\,H\,C\,L + 2\,H\,C\,L\,O = 2\,H_2\,O + C\,L_2$$

When air is brought in contact the hydrochlorous acid liberated by the $C\,O_2$ of the air sets free oxygen.

The additions of bleaching powder is involved in the use of of the chemic, from which we get the name of second stage called chemicking. The goods are treated at about 2 degrees T W under a sieve for two hours.

The third stage is the souring or the addition of some mineral acid such as sulphuric acid which decomposes the remainder of the bleaching powder. As previously stated the bleaching process takes place largely through this process.

Different agents are employed in the process of saponification such as soda ash, lime water or resin soap, depending upon the cheapness of the respective material. If lime water is used muriatic acid is more preferable to sulphuric acid as it forms a more soluble compound with lime. Sulphates are more insoluble than chlorides in fact it is almost impossible to decompose sulphate of lime.

The tendering of cotton by bleaching is due to the cotton fibre being converted into cellulose. This not only weakens the fibre but helps to assist the fibre in its affinity for coloring matter. An excess of mineral acid tends to destroy the fibre. Acetic acid would be preferable but it is too expensive. Such bleaching agents as peroxide of hydrogen and sodium have strong oxidation qualities. They are impracticable for cotton owing to increase cost of production. However, they are used to a limited extent on wool, mixed cotton and wool fabrics.

MORDANTS, FIXING AGENTS AND ASSISTANTS.

Under this head is included in brief the most important substances used. It is impossible to write fully as to the respective actions under all conditions as well as the complete number of all substances. The following are taken up in the order of their importance.

The word mordant is derived from the French, meaning to bite. Mordant is equally as important as the coloring matter itself, as regards choice, amount and application with its respective colors, fibre and manner of use.

BICHROMATE OF POTASH.

The chrome oxide Cr_2O_3 is the real mordanting material in the bichrome and its extraction is brought about by the reduction of the chromic acid. Of late years it has become a most important substance, and is one of the strongest oxidizing agents in the list of standard chemicals. It finds a large consumption in the textile world.

Especially in the hosiery mills bichromate of soda, owing to its cheaper price, has replaced it almost wholly among hosiery manufacturers. Among woolen and cotton mills the potash is preferred. With cutch it deposits chromic oxide on the fibre and oxidizes the catechin extracted from cutch into brown saponic acid. It finds extensive use with aniline salt on account of its strong oxidizing properties. It is a most important mordant on wool, especially with logwood and the so-called two dip blacks. Wool, having great affinity for chromic oxide, a small quantity of acid is used along with it to liberate the chromic oxide from the bichromate.

SULPHATE OF ALUMINA.

When used with cotton alone it is not of much value but in conjunction with some fixing agent which precipitates the alumina on the fibre it is a most useful mordant. The fixing agent may be a neutral salt such as phosphate of soda, ammonium carbonate or even soap or oil. Alum is more generally used by dyers as it contains more or less mordanting properties than found in sulphate of alumina besides being more regular. It may or may not be of a basic character. When applied to wool some tartar is usually used. Tartar in any form helps the brilliancy of shade as well as the depth.

IRON.

The application of iron in any form is generally termed saddening. Shade is due to the formation of a color-lake with the coloring matter deposited on the fibre. Iron in the ferrous or unoxidized condition finds its best use in the commercial product iron liquor, and is applied on cotton with some tanning material, as dark shades are more generally sought and taunate of iron is formed along with the coloring matter.

Iron in the ferric condition finds its most important use with the silk dyer in getting the desired weight. With logwood all shades of black can be produced, ferric salts giving brownish blacks and ferrous salts blueish blacks; a combination of the two will give jet black.

The ferrous salts are more useful in the form of acetate salts and the ferric salt as soluble ferric sulphate.

TIN MORDANTS.

Tin in either the stannic or stannous condition finds a most useful scope. The stannous salts are used chiefly for wool and the stannic salt for cotton. The stannous salts are powerful reducing agents for cotton and the cotton printer uses large quantities of tin crystals to reduce the aluminum mordants. If used in larger amounts the tin crystals resist the iron mordants. Tin in the stannous condition, if used on wool, tends to give the coloring matter a bloomy shade. Copper mordants serve principally for their oxidizing value, especially on cotton.

TANNIC ACID.

This acid is sold commercially chiefly in the form of sunac extract which contains more or less of the acid. It is derived principally from leaves of the sumac, also from gall nuts, zuerbracho and myrobolams. Its action on cotton is to form a color-lake with certain basic colors. When used with cotton some fixing agent is advantageous, tannic acid acts also as a fixing agent with alumina, tin or iron.

Direct colors are now employed to a large extent especially in the production of blues. The cotton is dyed in the usual way with direct colors and afterwards the basic color is employed. An illustration would be the use of Indian blue over a direct blue bottom.

FIXING AGENTS.

The property of fixing agents is to render the mordant soluble in order for it to be precipitated on the fibre. If the salt of antimony is added to some form of tannic acid the metallic salt is fixed on the fibre. Tartar emetic precipitates tannic acid if neutral salts such as common salt or chloride of ammonium are used along with it.

Whitening or calcium carbonate is used to neutralize acid solutions, and is a fixing agent for alumina on cotton.

ASSISTANTS.

All substances which enter into the process of dyeing outside of coloring matter, mordants and fixing agents are usually classified as assistants. The more commonly used are acids on wool and common salt, and glaubers salt on cotton. An illustration would be the use of sulphuric acid to liberate chromic oxide from bichromate of potash. Some assistants allow the color to go on fibre rapidly, while others retard its absorption.

On cotton common salt and glaubers salt increase the rapid dyeing of direct colors by raising the specific gravity of dyebath, thus raising the boiling point. All carbonates retard the process of dyeing and are ofttimes used for shades where the color must be put on slowly.

Cream of Tartar finds a useful field in the dyeing of wool. It forms double salts with alum, tin, salts, etc. It also helps to brighten the shade.

Acids as previously mentioned are employed to neutralize the bath whenever necessary. Such assistants as soap, alizarine oil, castor oil, turkey red oil, etc., serve a useful purpose in the dyeing and finishing of cotton and wool.

SULPHUR COLORS.

Sulphur colors had their beginning with the old Cachou de Laval, made by fusing some organic material, such as sawdust with caustic soda and sulphur. Very fast shades of brown were produced on cotton by using this product. Today practically any shade outside of red can be produced with this class of dyestuffs, although they find their principal use for production of black, blue and brown.

The consumption of sulphur blacks has been remarkable in the past four years, as shown by the decreased use of diazotized and developed black. They find ready use on raw stock, where a black fast to washing and fulling is wanted, which never could be obtained by any other class of dyestuffs.

The newer brands on the market, owing to their concentration and other improvements in manufacture, make them almost as easy for manipulation as the so-called direct blacks.

Sulphur blues have found a valuable field in the production of indigo shades both on warps and raw stock. Their use however, at the present day, is more applicable to raw stock than on the warp. They lack somewhat the bloom of indigo and are not so fast to chlorine. This element usually destroys all sulphur colors easily, although some types will stand the cholrine process in weak solutions.

The first introduction in a commercial way with sulphur blues, was Pyrogen Blue R manufactured by the Society of Chemical Industry. This blue was of a reddish tone and the warps required a smothering process by allowing them to stand in the trucks two hours or more. The shade after coming out of the dyeing machine had a dull, greenish, appearance. On lying for some time it developed into a deep, rich, blue. Immedial Blue C manufactured by Cassella Color Company, soon after was put on the market and came in active competition. In fact the patents of the two colors were owned jointly. At the present day, however, these blues have been replaced by the more direct dyeing sulphur colors and the Katigen blues of the Continental Color Company, are a valuable addition along with later products of both the Pyrogen and Immedial colors.

Sulphur blacks are now an important dyestuff with the leading dyestuff houses in this country, their types as regards strength, shades, solubility, being similar with the best manufactures. Owing to their increased demand competition has forced the price down so that the same identical black can be bought at one-half the price today than three and four years ago.

Sulphur browns and greens are now finding a market in the textile world, recent improvements having made these colors more concentrated and their cheap money value enables them to be used more or less for practical purposes. Greens are now sold which have that desired brilliancy so long lacking in the old products.

As a general rule it is more costly to dye sulphur colors than with the direct or basic colors, although the price per pound is usually cheaper, it take from two to five times the amount of dyestuff, along with an additional amount of chemicals necessary for complete dyeing.

A manufacturer is, of course, familiar with the cost of production, and whether or not it is advisable for him to change any or all of his shades by adoption of sulphur colors, the object of getting fast colors makes him decide whether or not he adopts this line of dyestuffs.

The proper addition of chemicals, washing and developing has to a large measure, made the success of sulphur colors. They are put in the solution with sodium sulphide and the relative amount should be first determined by solubility of the respective dyestuffs. Excess, especially with sulphur blacks, should be avoided, as it tends to destroy the color lake formed. Only enough should be added to put the dyestuff in solution, which can first be determined by placing a drop of the solution on paper or holding a test tube partly filled with liquor toward the light. There should be a uniform liquor as regards appearance of solution; any particles will show the undissolved dyestuff.

With sulphur blues it is better to have an excess than an insufficient quantity—not only is the dyestuff precipitated more easily on the fibre, but a sufficient amount helps the blue to oxodize more rapidly and evenly.

Some alkali either soda ash or caustic soda is used to neutralize the acid formed by oxidization of the sodium sulphide. The bath should have an alkaline reaction. Caustic soda tends to brighten the shades, especially the blacks, more so than soda ash. If soda ash is used in excess it will tend to give the color a redder tone.

The use of common salt along with the bath is the same as its application with any direct color. The specific gravity is increased, the boiling point is raised and assist in precipitating the color on the fibre.

Next to proper addition of chemicals thorough rinsing is essential, as to immediate rinsing all depends as to whether the dyestuff in particular is developed more thoroughly and evenly with or without washing after dyeing. With blacks and browns it is customary to rinse thoroughly at once, in order to overcome any bronzy effects. However, with blues, the cotton, either on raw stock or warps, is usually allowed to stand at least two hours. The smothering helps to develop the shades and a deeper, bloomier, result is obtained.

If sodium sulphide in excess is allowed to stay on the warps too long the shade will be prone to bleed. On blacks it has the property of giving them a bronzy effect, especially in contact with the air. Not only should rinsing take place at once, but thorough rinsing should be employed, as any excess of the sulphide will in time gradually oxidize, forming sulphuric acid, which readily attacks all cotton fabrics, principally in the yarn or warp and the goods will be tender thereby.

The addition of some soap after rinsing is beneficial, it softens the cotton and gives it a brighter and bloomier effect. This is especially noticeable on blacks, although it is advisable to use same on any shade of sulphur colors.

Alizarine assistant, Alizarine oil, or castor oil, is valuable for rapid development, besides it has a softening property. These last are used principally on the raw stock in place of soap.

On piece goods as yet they have found little favor; blues have the objectionable reddish cast where indigo shades are usually wanted. Even when cooled thoroughly they neither have the green tone or bloomy appearance so common to indigo or other printing blues.

On blacks the serious difficulty seems to be the bronzy effect, even if goods are dyed and rinsed in continuous compartments. Some success however has been obtained by use of the machines having at least four compartments—two for dyeing and two for rinsing. The rollers should have an elastic effect by being covered with burlap or rubber. No brass fittings should come in contact with either the dye bath or goods.

Jigger dyeing is becoming more popular as the dye bath can be made more concentrated. The best practical results are obtained with piece goods when they are kept continually immersed. By contact with the air they show the effects of oxidization very readily. The temperature can also be maintained more steady and kept at the maximum. It is probably not so much the fault of the dyestuff as it is in the machine. From a mechanical standpoint, many improvements could be made to make this class of colors a success.

A correct formula for dyeing sulphur colors cannot be given with any more accuracy than other classes of colors. The nature of the respective colors more or less change the amount in regard to the addition of chemicals. Roughly estimating, one pound of sodium sulphide conc. will dissolve one pound of dye. As the concentration of these colors vary, the following formula will cover only more or less the usual dyeing methods. It is usual to work down to a standing bath in three steps:

SULPHUR BLACKS.

(1) 100 lbs. stock
12 to 15 lbs. color
12 to 15 lbs. sodium sulphide conc.
5 lbs. soda ash
20 lbs. salt.

Dye at boil from one to one-half hours.

(2) 100 lbs. stock
10 to 12 lbs. color
8 to 10 lbs. sodium sulphide conc.
4 lbs. soda ash
15 lbs. salt.

(3) 100 lbs. stock
8 to 10 lbs. color
6 to 8 lbs. sodium sulphide conc.
4 lbs. soda ash
10 to 15 lbs. salt.

Some later types of blacks dye as low as 5 lbs. in standing bath. The regulation of sulphide, soda ash and salt is only approximate, as the more concentrated the color the more sulphide is usually necessary.

DIRECT DYEING SULPHUR BLUES. These dyestuffs comprise such groups as Katigen, Immedial, and Pyrogen colors. As previously stated they find their principal use on loose cotton. A standing bath should always be kept and three steps are usually necessary to work down to the standing kettle. Method usually as follows:

(1) 100 lbs. stock
9 lbs. color
9 lbs. sodium sulphide conc.
5 lbs. soda ash
20 lbs. salt.

(2) 100 lbs. stock
7 lbs. color
7 lbs. sodium sulphide conc.
4 lbs. soda ash
15 lbs. salt.

(3) 100 lbs. stock
5 lbs. color
6 lbs. sodium sulphide conc.
4 lbs. soda ash
10 lbs. salt.

With the pure drugs ordinary concentration will give a deep indigo shade.

On warp dyeing the blues are much more concentrated where development is necessary. As previously stated, blues needing oxidation are usually employed. The dye bath is kept for only three different dyeings. Warps apparently have a property of drawing more color from the dye bath than loose cotton. A deep indigo blue with the best products on the market can be obtained at from three to five lbs., of dyestuffs. The usual precaution in adding a dye solution to the machine should be followed same as in all warp dyeing processes.

(1) 100 lbs. stock
5 lbs. color
5 lbs. sodium sulphide
4 lbs. soda ash
10 lbs. salt.

Four runs are usually necessary and the warps allowed to smother for two hours before washing.

(2) 100 lbs. stock
4¾ lbs. color
4 lbs. sodium sulphide
3 lbs. soda ash
5 lbs. salt.

(3) 100 lbs. stock
4½ lbs. color
4 lbs. sodium sulphide
2 lbs. soda ash
10 lbs. salt.

These proportions serve only as a guide and show merely the cutting down of the colors and chemicals and increasing the salt in the last bath to throw out all color in the solution. Combination with the direct dyeing sulphur blues and blues needing long ovidation are employed. The effect being greener and brighter blues and a nearer approach to indigo shade can be produced.

From a laboratory standpoint, the usual receipt is to dye out comparative shades with at least 10 per cent of color, 10 per cent sodium sulphide, 5 per cent soda ash, 25 per cent salt. A ten gram skein of yarn is usually employed, dyed at boil for one hour.

THE ART OF DRYING.

George Wetmore Colles, in a recent issue of the Stevens Institute Indicator, points out that "there are, generally speaking, five different possible systems or processes of artificial drying:

1. The desiccation system.
2. The direct heat system.
3. The vacuum system.
4. The air current system.
5. The superheated steam system.

After showing that the great defect in the first three methods lies in the fact that no effort is made to remove the generated vapor mechanically, he states that "the most practical and the most universal of all drying systems in use are founded on the fourth above mentioned, namely, the air current system. Notwithstanding the fact that it is often necessary in drying by this system to impart to a vast volume of air heat which is in part thereafter lost and dissipated, it is usually more economical than either the direct-heat or vacuum system, because of the great mechanical (rather than thermic) advantages which it offers in acomplishing its object. These advantages are twofold, and consist, on the one hand, in the great facility with which the heat can be conveyed to the wet material through the medium of air, and on the other in providing a ready means for conveying away by mechanical force, as it were, the generated vapor which in default of such force hangs around and encloses the particles of wet material, thus preventing a rapid evaporation.

SODA CRYSTALS OR SAL SODA.

In many instances sal soda for dyeing purposes is preferable to soda ash. It happens oft times a mill has none in stock—soda ash being the only alkali on hand. In fact it is much cheaper for a manufacturing plant, using large quantities of sal soda, to make it, especially where the freight rate is high, as sal soda crystals contain over 60 per cent of water. The method of making sal soda is as follows:

In a large tank dissolve ordinary soda ash in hot water. Allow the hot solution to stand until all sediment deposits, then draw off the liquor into a tank or wooden trough and allow it to cool at the atmospheric temperature. Crystals of nearly pure sal soda will be found. Sal soda has the formula $Na_2 Co_3 IO H_2 O$.

DIAZOTIZED AND DEVELOPED BLACKS.

The consumption of developed blacks have in the past year been greatly reduced by the increased demands for sulphur blacks, however, they still form an important part in the list o ffast colors, where a black on cotton is required fast to washing, especially when woven with wool.

The dyeing process consists essentially of three steps:

DYEING, DIAZOTIZING AND DEVELOPING.

The usual precautions with this class of colors should be followed. The developing bath should be thoroughly iced; the development should take place as quickly as possible after the diazotizing.

Where a large amount of work is done, the diazotizing bath is kept continuously, the warps usually absorbing about one-third of the bath. This should be replaced with the standard liquor. After diazotizing, the goods are dipped in the developing bath, afterwards washed, soaped and dried. Standing baths of developing solution is freshened up with three-fourths of quantity of first addition.

A general formula for the complete process of diazotized developed blacks is as follows:

For one hundred pounds stock:

DYEING:

Use six pounds color and twenty pounds common salt. Dye in the usual way for a direct black for one hour. Rinse thoroughly.

DIAZOTIZING:

For diazotizing bath use three pounds soda nitrate and twelve pounds hydrochloric acid at 32 degrees Tw. Seven and one-half pounds sulphuric acid 168 degrees Tw.

DEVELOPING:

The developing bath should be ice cold and made up with one pound beta napthol, and one pound sodium hydroxide or caustic soda 76 degrees Tw. The colder the bath the bluer the shade, and the warmer the bath becomes a much redder shade is obtained.

The best machine for this dye is one composed of three compartments, each with squeeze rollers. The sodium nitrate and acid should be added separately. Add one-fourth to diazotizing bath and the remainder should be added slowly to the bath while the warps are passing through. It is best to add the developing solution the same way. If this machine, of three compartments, is used, the middle compartment should contain the rinsing water. As in all cases with this class of dyestuffs different developers can be used, and different shades of black can be obtained.

CHEMICAL APPARATUS FOR THE DYER AND CHEMIST.

Every well organized mill should have certain chemical apparatus for making experiments and tests of its own, for the use of the dyer, so that he may have a comprehensive idea of the tinctorial value of materials that he uses. No dyer that takes an interest in his work, and has a taste for research and experiment,

FIG. 1.

FIG. 2.

FIG. 3.

feels satisfied to be without such apparatus as will enable him to conduct tests applicable to his work. Such apparatus is manufactured and can be obtained of J. & H. Berge, 95 John street, New York City. A few of the things in their line we herewith illustrate, showing a nest of beakers for boiling solution, catching filtrates, etc. (Fig. 1); Bunsen burner for heating beakers and dishes containing solutions, and heating crucibles, baths, etc. (Fig. 2); casserole for boiling acids, colors, etc., and an evaporating dish for boiling acid solutions and for evaporating solutions to dryness (Fig. 3). Every dyer should have included in his equipment, test tubes and test tube supporters, the former being used for making solutions of chemicals in small quantities. They will stand heating and are used in making side tests during analysis. Other implements might be named, as necessary to the chemist or dyer, such as flasks for dissolving substances to be analyzed or tested, evaporating dishes for various processes, and mortar and pestle for pulverizing and mixing chemicals.

ORIENTAL CARPETS.

The carpet industry flourishes as never before in both Persia and Asia Minor. The market value of the carpets may be the same in the two countries, yet a great difference exists in the way they are made. This applies not alone to the various shapes and lines, but to the grouping of forms and colors as well, which enables even one unskilled in the business to distinguish between the make of Smyrna and that of Tabriz. The article which is sold in the world's markets as the celebrated Smyrna carpet is not made in Smyrna, it is a product of the vilayet of Aidin, of which Smyrna is the capital. The production of carpets in Asia Minor is essentially a house industry and the natives are exceedingly skilful in their handiwork. The industry gives employment and a livelihood to thousands of needy people, especially women, who are obliged to do the work almost entirely, while the men spend their time in the coffee houses drinking strong coffee and smoking numberless cigarettes, all in true Oriental fashion. Little girls are compelled to take up the work early, at 7 or 10 years of age at the latest, and they keep at it unceasingly until they go to their graves.

Some efforts have been recently made to introduce the carpet factory system into Smyrna, which has been attended with indifferent success. Labor is dearer in Smyrna than it is in the country districts, and the girls and women must pay more for food and lodging in this city than in the country villages. Many claim that the work done on the looms at Smyrna is more exact in measurement and neater in appearance, for the reason that the manufacturer or merchant is able to superintend the operations at any time of the day, thus preventing mistakes which might prove fatal to some beautiful design. The looms set up in Smyrna and operated by some 60 girls, number 20. On the whole the experiment does not seem to be a success, and the number is not increasing.

Uschak carpets are made in two styles. They are made either of spun wool or long wool, those of the former costing from 98 cents to $1.63 per square yard, the latter, $2.45 to $4.90, according to the design and color and the size of the carpet. The web and the woof of the Uschak carpets are made of the wool of the fat-tailed sheep. The men wash this wool in the rivers and the women comb and twist it softly in such a way as to allow the threads of different colors to lightly blend on the edges in the same way as the different tones on a picture.

The spun wools are not dyed by the weavers themselves, but by special dyers. For a short time artificial dyes were used, but their use was soon abandoned in favor of the better taste displayed by the amateurs of oriental carpets who desired the ancient models and colors, thus reviving the use of vegetable colors extracted from madder, yellow berry, and valonia, and other products of the country, and from indigo brought hence by caravans.—*Consular Reports.*

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

The cotton mills throughout New England, generally, are talking about shutting down the latter part of August, to remain closed for one month in order to give their employes a vacation. The mills of Lowell, Manchester, N. H., New Bedford, and other places are said to have agreed to this arrangement, and that many other manufacturers regard the plan with favor. All the mills have orders which will keep them busy all summer, but as the operatives insist on a vacation the corporations are not opposed to it, and will repair their machinery and other equipments during the idle period.

It is stated that twelve large cotton mills will soon be started in Texas. This industrial movement began several months ago and plans are now in a fair way of consummation for the erection of mills at Caldwell, Sulphur Springs, Alvarado, La Grange Waco, Ballinger, Georgetown, Marble Falls and a number of other places. In most instances local capital will alone be employed, which the banks are inclined to facilitate, as they are overflowing with money, and little difficulty is experienced in enlisting investments by farmers and merchants of their earnings that they now have in bank. Altogether these new enterprises will require, it is thought, one million to two million five hundred thousand dollars. Plenty of help seems to be assured in the immediate neighborhood of each proposed establishment.

A knitting mill is to be organized at Caroline Beach, N. C., with a capital of $30,000. E. N. Tarty, Fulton House, Wilmington, N. C., can furnish information.

A knitting mill is in contemplation for Wilmington, N. C., in which A. N. Dubois of that place is interested.

Plans are being made for a cotton mill at Stuart, Va., in which M. V. Stidman of that place is interested.

It is stated that plans for a new cotton mill at Newbery, S. C., are in contemplation, in which Frank R. Hunter of that place is interested.

Plans are being made for developing a water-power and building a large cotton mill at Zirconia, N. C., in which J. C. Bolton, Boston, Mass., is interested.

It is stated that a cotton mill is to be built near Statesville, N. C., in which M. K. Steeple & Son, of Turnersburg, N. C., are interested.

A scheme is in progress for building a cotton goods bleachery at Chickamauga, Ga., to cost $100,000. The Bowden Jewell Co., Chattanooga, Tenn., can furnish information about this project, and also about one for the erection of a cotton-bag mill, to cost $400,000, also at Chickamauga.

The business men of Washington, N. C., are interested in the organization of a company to build a cotton mill, with a capital of $150,000 to $200,000, toward which $100,000 is expected to be raised by local capitalists. Information can be obtained from John H. Small of that place.

The Pepperton Cotton Mills, Jackson, Ga., are to double their capacity, so as to bring the plant up to fully 25,000 spindles, with the necessary number of looms.

The Davis Hosiery Mills, Chattanooga, Tenn., are to increase their productive capacity by adding one hundred knitting machines.

The new ten-hour labor law, affecting the cotton mills of South Carolina, which passed the last legislature of that State, went into partial operation the first of this month, when every cotton mill in the State rearranged its time schedule. Beginning with the first of this month, the law limits the hours to 62 a week, the 60-hour schedule to go into effect the first of next January. There is a provision in the act that lost time accruing from accident or other unavoidable cause may be made up to the extent of 60 hours in the course of a year. The mill people say the new law will be promptly and permanently obeyed both in the spirit and to the letter. They say the change will operate against them, as both North Carolina and Georgia still have a 66-hour law, and competition for help is sharp.

It is expected that Wilson, N. C., will soon have another cotton mill, in which local capital will be interested, one prospective subscription being $25,000.

Efforts are being made to induce capital to Atkinson, N. C., for the purpose of building a cotton mill. Edmund A. Hawes, Jr., of that place, can furnish information.

The Ferguson Textile Co., Puducah, Ky., has been incorporated with a capital of $200,000 for the purpose of operating a plant for making water-proof cloth.

An instance of welfare work is the plan of the Graniteville Mfg. Co., Graniteville, S. C., to erect a building at a cost of $13,500, for the amusement and recreation of its employes. The building is a large and roomy one, with a hall 60x60 feet, for dances, etc., with rooms for parlor, library and billiards.

Work on the new Peerless Cotton Mill, Lowell, N. C., is nearing completion and by the time the transformers are installed the mill will be ready to start. The building is 325x100 feet inclusive of he boiler room and the transformer house. The transformer house is 15x20 feet, the boiler room for the heating plant, 35x35, and the picker room 25x100 feet. Electricity will be the motive power and 13 motors of different sizes are stationed throughout the building to give an independent power to each division of the machinery.

The cotton manufacturers of Augusta, Ga., have posted in their mills official notice to employes of an increase in wages to steady workmen. To the employe who will work twelve days every two weeks—the mills pay days occur once every two weeks —a bonus of six per cent advance is offered. To the employe who will work 11 days in each two weeks an advance of five per cent over the wage scale is given. The purpose, of course, is to put a premium on the steady workmen, to discourage loafing and to keep the machinery going.

The Cora Cotton Mills, Kings Mountain, N. C., are planning to add to their present plant, which now consists of 10,684 spindles.

It is said that the High Shoals Co., High Shoals, N. C., is to add 5,000 spindles to its plant.

The Elk Cotton Mill, Fayetteville, Tenn., is to add 6,000 ring spindles to its equipment, thus doubling its capacity.

The Woodbury Banking Co., Woodbury, Ga., can furnish information concerning a scheme for building a cotton mill in that place with a capital of $75,000.

The Eureka Mfg. Co., Lincolnton, N. C., has been organized with a capital of $40,000, to build a cotton mill. J. L. Laneberger, of that place, can furnish information.

The Harriett Cotton Mills, Henderson, N. C., now operating 27,000 spindles, are to erect a $200,000 addition, for which purpose the capital stock will be increased from $300,000 to $450,000 and appropriate $50,000 from a surplus fund.

The Board of Trade, and others, of Fort Worth, Texas, are interested in the organization of a $200,000 cotton mill at that place. It is said that $100,000 has been subscribed by a New York party; Sam Davidson, of Fort Worth, subscribing $50,000.

The Martin Hosiery Mills, Raleigh, N. C., are to change their line of production to finer grades of hosiery, and for this purpose will soon install additional machinery.

The McNeill Manufacturing Co., Fayetteville, N. C., has been organized, W. D. McNeill, president; J. V. McGougah, vice-president; C. L. Penderton, secretary and treasurer, to erect a 10,000-spindle mill at a cost of $200,000, on Little River, 10 miles west of the city. The company has a water-power of 700-horse, 300 of which will be used at the start.

The new wage schedule for the Fall River (Mass.) Cotton Mills provides that 21.78 cents per cut shall be the recognized standard price for a margin of 95 points based on the cost of eight pounds of middling uplands cotton and the selling value of 45 yards of 28 inch, 64x64s and 33.11 yards of 38½ inch 64x64s. With a margin of 115 points, 23.96 cents shall be paid.

Wages of mill operatives are advancing in Europe as well as in the United States, and the German Association of Textile Manufacturers has reduced the hours of labor of all hands to ten hours a day. There is a scarcity of both male and female operators.

THE DRYING OF DAMP GOODS IN WET WEATHER.

There are various processes of manufacture in which goods have to be wet while under manipulation and dried again before they are finished. As in all manufactories each operation must be completed within a certain time, it has been unsafe to depend upon the state of the weather for the purpose of drying, although at certain times it may offer every facility for the operation. There are many cases also where a factory has not sufficient space to expose its goods to the action of the air and the sun; it is then necessary to provide means of producing a rapid current of a certain desired velocity, which, when directed through the goods, will carry off the surplus moisture they contain. Wet clothes may be rapidly dried in this manner by being hung upon racks in a room so that a current of air may circulate between them. The rate of drying will depend partly upon the dryness and partly upon the temperature of the air passing through the goods. During the rainy season, when air is nearly saturated with moisture, drying takes place very slowly under ordinary circumstances even if a steady current should pass the material to be dried; but as the capacity of air to absorb moisture varies with the temperature, it may be made more absorbent merely by heating it. By heating air with moisture saturation of 90 per cent to 110 degrees F., the saturation is reduced to from 90 to 42 per cent., roughly, and the air is thus able to absorb as much again of water as it at first contained without being damper than its original condition. In this manner by simply controlling the temperature of the current of air its drying power may be assured whatever the state of the weather may be.

Until a few years ago all of the final pressing of Egyptian cotton was done in Alexandria, but of late years it has been found an advantage to have smaller establishments in the country, and there are several such now in operation which are mostly controlled by merchants who ship their cotton direct, and who do not offer it for sale in Alexandria, since steam-pressed bales cannot be delivered against sales of contracts except under very onerous conditions.

Bleaching powder is lime filled with chlorine. Chlorine is a greenish yellow gas, which is produced by the action of heat on a mixture of three parts of common salt with two parts peroxide of manganese, and two parts of sulphuric acid diluted with a like quantity of water.

The cotton plant on the whole is a hardy one, and will stand comparatively long periods of drought, but when too much water is applied the plant is inclined to favor the leaf rather than the pod.

AMONG OVERSEERS AND OTHERS.

We should be pleased to receive notices of any changes among agents, superintendents, and overseers in textile mills.

George B. Hamby is now overseer of weaving at the Tupelo Cotton Mills, Tupelo, Miss.

Geo. W. McKenzie has taken the position of overseer of carding at the Millfort Mill, Fort Mills, S. C.

N. T. Brown has recently taken the superintendency of the Nantucket Mills, Spray, N. C.

G. C. Meredith has taken the position of the cloth room of the Gluck Mills, Anderson, S. C.

J. H. Wilson is now superintendent of the Birmingham Cotton Mills, Birmingham, Ala.

J. A. Sumney is now superintendent of the Tyger Cotton Mills, Fairmont, S. C.

W. Y. Harrison has taken the superintendency of the new mill at Calhoun Falls, S. C.

D. V. Brannon is now overseer of weaving in one of the cotton mills in Union S. C.

J. A. Barlor has taken the position as overseer of weaving and slashing at the Eufaula Cotton Mills, Eufaula, Ala.

C. E. Hall has taken the position as overseer of spinning, spooling and warping at the Richland Cotton Mills, Columbia, S. C.

J. E. Pressley has accepted the position of overseer of carding at the Worioto Cotton Mills, Nashville, Tenn.

J. Frank Broom is now overseer of twisting, warping and spooling for the Fidelity Mfg. Co., Charlotte, N. C.

James Brown is now overseer of spinning at night at the Elizabeth Cotton Mills, Charlotte, N. C.

C. A. Huckaby is now overseer of carding at the Central Mills, Griffin, Ga.

Jno. M. Wilborn is now overseer of weaving at the Central Mills, Griffin, Ga.

J. P. Pullium has taken charge of the spinning as well as of the carding at the Aetna Cotton Mills, Union, S. C.

W. W. Shaw has been appointed superintendent of the Grendel, Mill, Greenwood, S. C.

J. L. Davis has been chosen superintendent of the Ninety-Six Cotton Mills, Ninety-Six, S. C.

D. L. Garrison has taken the position as overseer for the Melville Mfg. Co., Cherryville, N. C.

T. F. Hoy is now the superintendent of the Hermitage Cotton Mills, Camden, S. C.

S. M. Mims has been elected superintendent of the Capital City Mills, Columbia, S. C.

The Japanese Government has just completely revolutionized the clothing of the army, and according to the details published in a German military review has reduced everything to a uniform simplicity, probably equalled nowhere else. Khaki is to be the only wear—cloth for winter and calico for summer. There is to be only one quality for officers and men. Grades will only be distinguished by means of stars and galons. It is also kahki of the same type and color for all arms, which will only be differentiated by the color and numbering of the collar. There will be a soft head-dress and yellow boots.

Small ginning establishments such as are found in the Southern States, whose only interest is to separate the lint from the seed at any cost to the fibre, do not exist in Egypt.

QUERIES AND ANSWERS.

We should be pleased to answer in our columns any query from a *subscriber, free of charge*, relating to textile matters, as machinery and processes, raw and manufactured material, etc. We will undertake the analysis of fabrics, showing structure, and how to produce desired results.

ATLANTA INTERNATIONAL COTTON EXPOSITION, 1881.

Editor COTTON: I am desirous of getting a copy of an official report or reports on the cotton exposition held in your city twenty odd years ago. I ask you to have the kindness to inform me if there were state or national reports published? If so, their titles, etc.

S. D.

We assume that our correspondent refers to the Atlanta International Cotton Exposition of 1881. We know of no state or national reports being made, and the only one with which we are conversant is that of the Director General, H. I. Kimball, that was published in 1882. We think that the only place where this report can be obtained is at some second-hand book dealer's. There are two copies of this report to be had at the Carnegie Library, Atlanta, which possibly can be temporarily obtained from the librarian.

SIZING GRAY COTTONS.

(Continued from April.)

DELIQUESCENT SUBSTANCES.

Chloride of calcium is in such general favor that little need be said of other deliquescent materials for goods having over 40 per cent of size in the warp. Besides its affinity for moisture it also acts as a softener, although if used for this purpose in too large quantities at the expense of a correct quantity of tallow, the yarn will become so damp that the parts of the loom with which it comes into contact will rust and cause iron stains to appear on the cloth. This material is usually delivered in a solid state and made into a solution at the mill. Twaddle's hydrometer is the instrument universally used for ascertaining the strength of sizing solutions and mixtures. It records the specific gravity of liquids heavier than water and when tests are being made the liquid should always be at a temperature of 60 degrees F. The degrees of "Twaddle" are designated by TW. It is usual to make the solution of this chloride "Twaddle" 56 degrees; it will then contain 24½ per cent of solid, and one gallon will weigh 12.8 pounds and have a specific gravity of 1.28. About 66 degrees Tw. should be the highest to which magnesium chloride solution is brought, for the reason that above that strength a portion of the salt is liable to crystallize and attach itselm to the sides and bottom of the tank. This substance must never be used unless a sufficient quantity of some antiseptic is employed to counteract the tendency to mildew.

ANTISEPTICS.

It is well to remember that whenever such highly hygroscopic ingredients as chloride of calcium or chloride of magnesium are used some antiseptic must accompany them, otherwise mildew would almost certainly develop and ruin the goods. Chloride of zinc is about the only antiseptic used in heavy and medium sizing, not only for its efficiency as such, but party because it is to a certain extent a softener. It also adds substantially to the weight of the yarn. It is ordinarily sold to cotton manufacturers in solution and in this form it not only may contain many impurities, due to its method of manufacture, but it is peculiarly susceptible to adulteration with other chlorides of a cheaper sort, some of which will seriously interfere with its antiseptic value. Other chlorides frequently found in the solution of zinc salts are those of magnesium, calcium, sodium (common salt), iron, and Glaubers salts. Many Lancashire manufacturers now require from the dealer a declaration of the exact composition of every purchase of zinc chloride solution. Thus they guard against fraud and probable damage to their goods, for mildew sometimes develops while the cloth is in the loom, but more often after it has reached its destination abroad. It is plain, therefore, that the manufacturer can not afford to risk losses due to manipulation by the adulterator of the only sure safeguard against his bugbear. A nice discrimination is needed to decide the proportion of this antiseptic which will prevent damage, for it is certain that too much of it has a detrimental effect upon the weaving. From 3½ to 4 gallons of the chloride is used to each 280 pounds of flour and this it is said is sufficient to preserve cloth from mildew under normal usgae, but if the goods are packed in a damp condition or afterwards receive a wetting, this strength may not answer. Liquid chloride of zinc in solution is generally sold at 102 degrees Tw, ot which strength a gallon will weigh 15.1 pounds and have a specific gravity of 1.51. In the solid state 45 pounds of chloride of zinc are equivalent to 100 gallons of solution at 102 degrees Tw.

SIZE MIXING.

There are so many methods of mixing materials and modifications of their previous treatment that they can not all be named. Some mills admittedly get better results than others, yet their secret will not be found in any special and unknown substances used in the batch, but rather in the purchase of materials of uniformly good quality and their careful mixing in proper proportions. To illustrate the latitude that exists, one authority says that "softeners will form from 7 to 14 per cent of the total weight of the size; antiseptics (chloride of zinc), 8 per cent of the flour or starch used; magnesium chloride, 5 to 10 per cent; but that both of the latter quantities may be exceeded when it is desired to increase the weight of the yarn by this means."

Wheaten flour is fermented for many reasons, although the practice is not now so common as formerly. Some goods are made to which 30 per cent of size is added, but to which antiseptics are not allowed to be applied, and under these conditions bay weaving would be inevitable unless the flour were first fermented for a long period. Others ferment flour to prevent harshness in the cloth, others to lessen the tendency to mildew, but where antiseptics can be used it is said that fermentation is altogether a wasteful process. Flour is fermented usually to separate the starch granules, but this can be done more thoroughly by steeping the flour with the chloride of zinc than by the long, costly, malodorous, and dirty process of fermentation. Further advantages of steeping are freedom from acid development and no loss of either gluten or starch—whereby the adhesive power of the flour is wholly retained, the china clay more firmly fixed in the yarn—which is also itself strengthened. Putrefaction decomposition not seldom occurs during fermentation, but it is impossible in the steeping process.

The risks of leaving out a portion of the zinc solution are reduced almost to the vanishing point—an important consideration. Most material is the fact that the ingredient with the greatest tendency to mildew is brought into intimate contact with the antiseptic before the strength of the latter is diluted by the addition of the remaining portions of the size. The flour, chloride of zinc, and water should steep for two weeks, after which it is ready for use. The proportion of water required is from 25 to 30 gallons to 280 pounds of flour. There are of course strong advocates of each method, but it seems to the writer that bringing the substance most susceptible to fungus growth into close contact with the materials which can prevent their development is the more rational method. It is obviously useless to first boil the mineral china clay with the antiseptic, yet the practice is often followed. As showing the divergence in view of different manufacturers on the fermentation method some firms limit the process to three days—which is worse than useless—while other concerns allow the process to continue for six weeks or more.

COMPOSITION OF MIXINGS.

In the face of the multitude of ingredients offered as suitable for sizing purposes, the more successful concerns confine themselves to the use of materials whose compositions are known to them, at the same time keeping their mixtures as simple as possible. Combinations of material are generally made to get a certain percentage on the cloth, but a mixing which would give 60 per cent on a fabric 50 by 40, would by no means put the same per cent on yarn of similar counts woven 72 by 72. Mixings must be modified to meet the construction of the cloth to which they are to be applied. No one mixing can be stated as certain to give a fixed percentage, for slight differences in ingredients or their treatment, weather, and the humidity of the atmosphere in the weaving shed will all cause differences in the result one way or another.

The mixing for 30 to 40 per cent is: Water, 135 gallons; chloride of magnesium, 60 degrees Tw., 9 gallons; tallow, 45 pounds; flour, 440 pounds; and china clay, 330 pounds, chloride of zinc having been first steeped with the flour in the proportion previously given; blue to suit.

The mixing for 50 per cent (coarsest yarns) is by percentages: Wheaten flour, 51½; china clay, 31; tallow, 10½; chloride of zinc, 3½; and chloride of magnesium 3½.

The mixing for 100 per cent is by percentage: Wheaten flour, 23; china clay, 31; chloride of magnesium, 15; chloride of zinc, 11; tallow, 15; gum, 2; and glycerine, 3.

The mixing for 140 to 160 per cent is thus made: Having first

steeped the flour, zinc chloride, and water in the proportions mentioned for two weeks, an extra amount is added to counteract the tendency of the cornstarch to mildew. The ingredients are: Water, 75 gallons; chloride of magnesium, 35 gallons; china clay, 1,790 pounds; tallow, 230 pounds; flour, 340 pounds; cornstarch, 120 pounds; and chloride of zinc, 1½ gallons.

Notwithstanding explicit directions from the buyer of the cloth, giving counts of yarn, sley, and pick, and per cent of size, some weavers here often depart slightly from instructions to their own advantage. The writer came across an instance the other day where 22s warp and 24s filling were specified, while 24s and 26s were being used, the otherwise resulting lighter weight being made up by extra size. Quantities to be mixed depend on several conditions, one being the weight of yarn to be sized. Allowance must be made for the loss of size by being rubbed off during weaving; and as all the mixture cannot be used, some must be left over.

ILLUSTRATIONS AND APPARATUS.

To illustrate—if 4,000 pounds of yarn are to be sized so that it will retain 80 per cent of dye, parting with 10 per cent in the loom and leaving 5 per cent in the beck, it will require 95 per cent of size, or 3,800 pounds; or, say, of wheat flour, 874 pounds, equaling 23 per cent; sago flour, 304 pounds, or 8 per cent; China clay, 1,672 pounds, or 44 per cent; softeners, 380 pounds, or 10 per cent; chloride of zinc, 190 pounds, or 5 per cent; and chloride of magnesium, 380 pounds, or 10 per cent.

Another mixing to give up to 200 per cent is, by percentage, wheat flour, 30; China clay, 44; castor oil, 3; tallow, 8; chloride of magnesium, 8, and chloride of zinc, 7.

The apparatus required for preparing a mixing depends almost entirely on the goods to be produced and the number of looms. In heavy and medium sizing a receptacle for the chloride of magnesium and a tank for the clay must be provided and the entire plant should be arranged to avoid as much as possible carrying or lifting by the mixer. An excellent modern arrangement is shown in an illustration forwarded which is sufficiently clear to explain itself. [The illustration will be loaned to the textile trade by the Bureau of Manufactures.] It will be noticed that the apparatus is in a two-story building. A late type of beck for heavy sizing with overflow valve and a size pump attached is also shown.

After a mixing known to be suitable has been prepared there are many pitfalls into which the sizer may stumble when applying the size of the warp. Uniformity is the goal to aim at, and in order to attain it care must be taken to see that percentages and strength of the ingredients used are always the same and that they are subjected to the same treatment for each batch. The materials must be thoroughly and evenly boiled and the size delivered into the size box of the slasher at a uniform rate. It is also essential to regulate the speed of the machine to dry the yarn properly and uniformly.

Unless absolutely unavoidable the size for medium and heavy work should never be simply boiled in a small tank attached to the slasher before being introduced into the size box of the machine. The weaving qualities of the yarn are materially improved by a more suitable method. A large boiling tank for this purpose is the most approved plan, in order to enable the mixture to be boiled sufficiently thin to be pumped to the slasher size box. This carries the clay and softeners in more complete suspension and contributes not a little to greater uniformity in results.

OTHER DETAILS TO BE OBSERVED.

The weight of the finishing roll of the slasher has a direct bearing on the quantity of water to be used, a heavier roll requiring less water and a heavier size than a lighter one. It is found that with size of a suitable strength a heavier roll produces a better-looking finished cloth. Attention must also be given to the pressure of the squeezing rolls; if not enough, the warps will go on the weaver's beam too damp for satisfactory working in the loom.

Uniform drying is essential to good weaving, speed of machine and steam pressure in the cylinders regulating this. When a standard of dryness has been established for the warps every set of the same sort should be kept to the standard. It may be taken that as the percentage of size is increased the amount of moisture to be retained in the warps as they leave the slasher should be greater.

Iron stains frequently occur on weighted goods. No matter how they arise, they cause loss and worry to the manufacturer. They generally develop either from impurities in the sizing ingredients, contact with rusty parts of the loom, or from water or black oil dropping on the cloth. All these evils should be guarded against as far as possible. Small quantities of common soda are sometimes added to neutralize any free acid the size may contain and prevent the formation of iron mold from this cause. Mildew can, as has been already shown, be almost certainly guarded against by the use of zinc salts in suitable proportions, coupled with intelligent sizing methods. Sizing is to the weaving department what carding is to the spinning of a cotton mill. At no stage from spinning to cloth can so much damage be done to the yarn as in the slasher. This statement applies with special force to heavy and medium sized work. Greater skill and experience is demanded from the man preparing warps for shirtings, T-cloths and domestics, than from the one engaged in pure sizing. There are so many points to be constantly watched that the sizer should have sufficient expert knowledge drawn from long practical experience to determine by the "touch" of the yarn whether all the conditions essential to a first-class product are complied with. When the weighted warps reach the looms it is absolutely indispensable that they be woven in a humid atmosphere. The weaving of "very heavily" sized goods becomes practically impossible in an atmosphere at all approaching dryness.

I have thus briefly touched upon the most important aspects of cloth weighting as practiced in Lancashire, and am sending to the Bureau of Manufactures a piece of cloth which will give an idea of the average sorts, as the sample is sized to the extent of over 90 per cent of the weight of the warp. The particulars of the cloth are attached to the piece.

The American Cotton Trade has talked for years of the importance of expansion in the export of manufactured cottons, which is the greatest item in the purchases of every nonmanufacturing country. Through the class of goods dealt with in this report will be found the path of least resistance. A large and steady demand in widely separated markets will, if assiduously and intelligently cultivated, bring about a growth in our exports of such character as will prevent a repetition of the disastrous times which overtook our cotton industry during the Boxer outbreak in China, which was solely attributable to the fact that the bulk of our comparatively meager exports were sold in the Chinese market. In no country where these sized gray goods are extensively used is there any tariff charge or regulation against us which does not equally apply to every one of our competitors. Instead of new mills being laid out to either make goods suitable only for our home requirements, or to meet the demand in China for the restricted class of American goods she takes, it seems to me that they might more profitably be designed to enter the foreign "gray" trade, which is the largest, most stable, and easily entered of any of the lines of cotton goods.

AMERICAN FINANCE.

By EDWIN W. ROBERTSON.

The price of money, like other commodities, is dependent on the law of supply and demand. But there are certain artificial conditions which exaggerate the operation of the law, and which can be remedied as easily as they can be created. It is on this phase of the money question that I wish to express to you my views.

I shall not essay a history of money, its uses and deficiencies, nor make any attempt to go into any of the remedies which, from time to time, have been advanced by would-be financiers as the only real panacea. I am one of those who, by nature have faith in the present and future. In a restricted sense I am an optimist. Coming from an agricultural section of our country, but a section which is rapidly becoming, beyond the realization of the world, a manufacturer of its own products, I have of necessity studied finance from the standpoint of our own needs, yet I believe I have taken a fair and impartial view for the general good. My business being in the line of money and credits, much opportunity has been given me to study and investigate the needs of the people and industries which surround my home, and this became more and more interesting as I watched the enormous growth which was every day apparent.

While I think the currency laws of this country are the outgrowth of war and necessity, I am not of those who believe in the inflation of currency not based on the true value of our products. There must be a standard of value, established not by the United States alone, but by the commercial world, which is at this time gold, and we must base our values on this comparison.

We may not have adequate or wisely elastic currency; yet what we have is not, in my opinion, properly husbanded. The flow of this country's resources is along a few channels, and is therefore irrigating less, year by year, the sources of production which are so abundantly spread over our entire country. Therefore, with a supply admittedly short, let us be the more cautious to see that proper distribution be made, in order that congestion in one locality may not mean damaging scarcity in another. Let us not confound this idea with any desire to injure the fabric of our large financial centers; for to tear down at this stage may be more disastrous than to permit present conditions and present financial methods to continue indefinitely.

It is by opening up more avenues for the distribution of credit that we give expansion to our country's almost unlimited resources. We all know how a railroad built through a new country increases its population, its agriculture, its manufactures, its wealth; then why not apply this principle to money? Instead of expending so much time and thought on how to create a so-called greater currency—a more or less flat creature—let us devote ourselves to the idea of a careful consideration of transporting the real money of the realm so as to meet the demands of the country as best we may.

Admitting that the currency laws of the country need some more elasticity, which may probably be best conserved by a large central bank, we are confronted at this time by the possibility of certain powerful speculative movements which have entered the field of actual money, as they have the fields of stocks and cotton, and it is to this side of the money question that we should at least pay the compliment of our attention. Money is a mere measure of value; the medium of settling balances, and when we consider what a small percentage is needed in trade for this purpose, we are almost persuaded that we have a sufficiency, if it could be so adjusted as to give its first use to actual business conditions, and lend its use secondarily to speculative needs; but unfortunately these conditions seem to be reversed.

Let me give you a concrete illustration of the effect a demand for money on the part of the stock speculator has on the ordinary money market. Under a normal stock market the margins on stocks, or the stocks themselves, are carried as a part of business; but upon any considerable variation in the stock market additional margins must be put up, and at such times the demand for money becomes very acute. With a chance of losing two or three thousand per cent in a few days, the mere rate of interest for a short time is nothing to the stock manipulator. He goes to his banker, who tells him that he has a normal amount of money to be loaned, but that other customers have not received their pro rata share, and he cannot lend him any additional money. Remember that the amount of money available for daily loans is comparatively small in proportion to the entire deposits of the bank, for the reserve must be maintained, the cash supply kept up, and the other needs of the bank met. The rate has been five per cent; the stock manipulator offers seven. The security is good and the banker can see no reason why he should not get the additional two per cent. Later in the day another stock speculator calls for more money. The banker again tells him that he has but a small amount available and cannot lend him. As a further inducement to make the loan he is offered nine per cent. Remember that this rate is nothing to the stock speculator, who can make or lose two hundred per cent in a day; but it is prohibitive to the business man. And so the price of money is bid up for stock speculative purposes until twenty per cent is no unusual rate for call money in New York. The money which has been loaned to business men on good paper at five and six per cent is called in as the paper matures, and turned over to the stock speculators, instead of permitting the business man to obtain his usual advances, which would have been the course had this stock crisis not occurred, and which was the course that the business man had a reasonable right to expect.

The banker asks why he should continue a five per cent or a six per cent loan, when he can obtain eight, ten or twenty per cent for the same money on equally good security. We can give him no answer. The fact remains that the law does not permit the business man to bid over a given rate; whereas it enables the stock speculator to bid as high as he pleases. In other words, the present law is a handicap to the business men, and a great protection and benefit to the stock speculator. This is not intended, and should not be permitted to exist.

SOUTHERN SPINDLE AND FLYER COMPANY.

Those attending the cotton manufacturers' convention at Philadelphia, from the South, and who viewed the more interesting exhibit of textile machinery at the Armory, were struck somewhat forcibly by the fact that exhibitors from the Southern States were conspicuous by their absence; which, in a measure, proves that while the South is a strong competitor of the North in the manufacture of cotton fabrics, it remains almost alone in the manufacture of cotton mill machinery. This makes the South more or less dependent upon the North in business, on account of the long distance from which the former is obliged to buy its machinery, and especially so in view of the poor freight service it is receiving from the railroad at present.

So few were the exhibitors from the Southern States, it is a pleasure to mention the Southern Spindle & Flyer Company, Inc., of Charlotte, N. C., whose exhibit of presses was one of the best we have seen for some time from the point of quality of goods displayed. The same consisted of a number of different styles of pressers, neatly mounted upon an easel, showing a few of the many different degrees through which a presser goes during the process of manufacture from a bar of Sweedish iron up through the black process, to the end of finishing.

While in the past this concern has confined itself principally to repairing and overhauling, it has forged ahead in manufacturing to such an extent that it has gained the distinction of being one of the very few concerns in the country, and the only one in the Southern States, that are at present manufacturing the above named commodity.

It may not be out of place to mention that this enterprising concern is drawing skilled workmen from Northern shops, as well as from England, which together with the latest improved English and American make of machinery, and its several patents, enable it to manufacture and repair the most complicated machinery of a cotton mill.

The Clayton & Bentley Co., Atlanta, Ga., manufacturers of the Clayton & Bentley thin-place preventer, have recentley equipped all of the looms in Mills Nos 1, 2 and 3, of the Pelzer Mfg. Co., Pelzer, S. C., with their thin-place preventer, and have also equipped all the looms of the Columbus Manufacturing Co., Columbus, Ga., with the same device. They are now equipping the looms in Mill No. 4, New Holland, Ga., of the Pacolet Manufacturing Co., and the looms of the Orr Cotton Mills, Anderson, S. C.

The Power Specialty Co., 111 Broadway, New York, report recent sales of 120 Foster superheaters,, aggregating 42,000 H. P. These superheaters are to be installed in B. & W., Stirling, Edge Moor, Heine, Franklin, Atlas and other boilers, including a number of return tubular boilers.

American seed is as unsuited to Egypt as Egyptian seed is to the Southern States.

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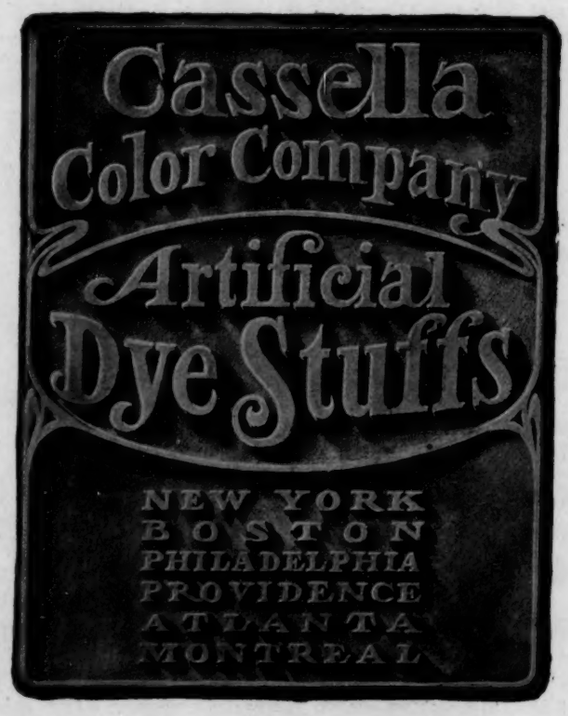

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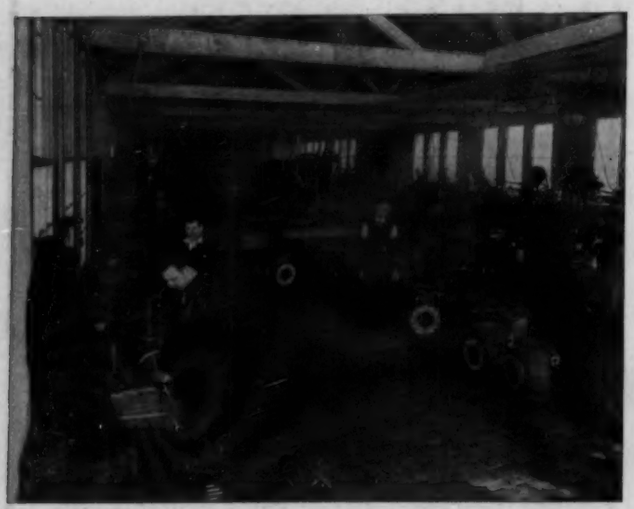
LAGONDA MANUFACTURING COMPANY.

THEIR NEW PLANT, SPRINGFIELD, OHIO.

Twenty years ago when water tube boilers first began to be introduced a man named Weinland invented a machine for cleaning scale from out the tubes. It was of the type now known as the "turbine". When these cleaners were put on the market, the business was carried on in a 10-foot by 12-foot room, the

TURBINE CLEANER DEPARTMENT.

cleaners being made outside. The venture proved sucessful, and the cleaners came into favor so rapidly that machinery for their manufacture was purchased and installed in a room 24-feet by 24-feet. The company then began to take contracts to clean boilers. In that way the merits of the cleaners were demonstrated to possible customers, and those who did not care to bother with the cleaning themselves, were assured of having the work done quickly by competent men. Again the quarters became too small. This time the plant was moved into a 28-foot by 70-foot two-story iron frame building, (built by the present company) and every effort was made to build the most and the best cleaners used in this country.



AUTOMATIC CUT-OFF VALVE DEPARTMENT.

As water tube boiler plants became larger and larger, the scale problem assumed more importance and the time that boiler had to be laid off for cleaning represented a heavy loss of revenue, so the Lagonda Manufacturing Co. sought to devise some machine that would permit the application of greater power to the scale cutting device than was possible with the turbine cleaner. The result was their Weinland mechanical boiler tube cleaner which can be propelled through the tube by any power, from a 4 H. P. water motor to a 25 H. P. steam engine or electric motor.

Where scale is exceptionally hard or thick, or where there are so many boilers that cleaning becomes a heavy item of expense, or where the water for driving turbine cleaners would cost considerable, the power driven mechanical cleaner is by far the most economical device that can be used. It is also, much cheaper to maintain, as its parts are almost indestructible and are cheaply replaced.

The Lagonda Manufacturing Co. have also added other specialties. A new plant has therefore just been built consisting of a two-story 50-foot by 200-foot building located on two acres of ground which will be available for further growth.

The new building, although not first in size among modern factories, is a model in the character of its construction and equipment, and it is undoubtedly the largest plant in the world building boiler tube cleaners.

In the turbine cleaner department are many expensive special machines. All the lathes and automatic machines are made with special attachments for turning out the peculiar bearings, waterwheels, arms and other small parts accurately and in great quantities.

The cut-off valve department is devoted to the manufacture of a device placed in the steam connections of boilers for automatically stopping the passage of steam in either direction in case a steam main bursts or a boiler tube gives away.

WING'S TURBINE FAN.

The acompanying illustration shows Wing's turbine fan, made by the L. J. Wing Mfg. Co., New York. This fan is a combination of two well known machines—the Wing disc fan and a well designed turbine-engine—which this company have been putting on the market for over a year, meeting with great success, and finding unlimited demand for such a combination. The blades of the fan are practically the same as those used on the well-known Wing disc fan, used for ventilation, run by a belt, electric motor, or direct-connected old type engine. The turbine

engine consists of a series of turbine buckets, or vanes, fastened to a band or ring, which in turn is fastened to the end or periphery of the fan blades. Two or more nozzles of special design impinge the steam into the buckets, which causes the fan to rotate. The small amount of steam from the nozzles, after exhausting all of its energy in driving the fan, passes along with the air so that no exhaust pipe is required. At the present time, the fan is largely used for mechanical draft for boilers, the advantages of which system are well known and recognized. The fan is equally available for humidifying the air in factories, and can be used to advantage for drying goods and removing steam, dust, powder, etc. There are no valves to grind and little or no care or attention needed, except to fill oil cups occasionally.

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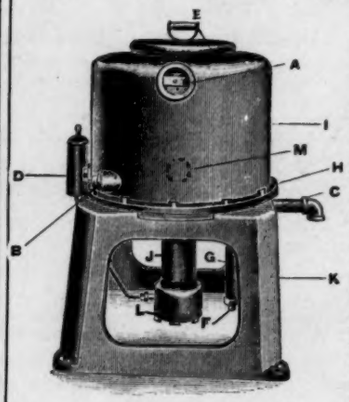

CHART

A—Exhaust. B—Steam Jet. C—Oil Outlet. D—Oil Cup. E—Cover. F—Plug (for removing dirt in trap). G—Oil Trap. H—Cap Screws (for holding shell to base). I—Shell. J—Column. K—Base. L—Step Bearing. M—Brake.

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PRACTICAL COTTON CALCULATIONS.

Ernest Whitworth, formerly principal of the designing and cloth analysis department of the New Bedford (Mass.) Textile School, has just published the second edition of his "Cotton Calculations", being a treatise relating to cotton yarn, cloth structure, loom and miscellaneous cotton mill calculations. Price $1.25. This work is bound in a form for easy reference as a text book. Most of the rules and methods have been obtained from data gathered from practical experience.

The Lynchburg Cotton Mills, Lynchburg, Va., gave their work people, May 20th, an additional advance in wages of 7½ per cent. An advance of 10 per cent was made last August, thus making a total advance of 17½ per cent more than the schedule to strengthen the yarn considerably.

THE BUFFALO FORGE CO., Buffalo, N. Y., have issued a folder showing their electric disc wheels, which they keep in stock for immediate shipment, equipped with 110 to 500 volt direct current outfits. Also their standard pulley disc wheels, and special high efficiency disc wheels for cooling towers, and propeller disc wheels with curved blades.

THE LUNKENHEIMER CO., Cincinnati, Ohio, have issued an attractive booklet, relating to their generator valves, which are made in various types and designed to meet various requirements. They are not intended to take the place of the regular in-let valve on engines of the four-cycle type, but on engines of the two-cycle type they take the place of the usual check valve on the crank case. The workmanship on these valves favorably impresses the mechanic. The discs are light and strong, and manufactured of a special bronze composition, and will not pound. Should they wear they can readily be reground by removing them, and placing a little powdered sand, or glass, and soap or oil on them.

At a special meeting of the directors of the Joseph Dixon Crucible Co., Jersey City, N. J., held May 31st, Geo. T. Smith was elected vice president; Geo. E. Long, treasurer, and Harry Dailey, director and secretary, in consequence of the death of vice president and treasurer, John A. Walker.

The American Moistening Co., Boston, Mass., report that they did the largest volume of business in their history for any five months since January 1st, 1907, during which period they sold over twenty-seven hundred humidifiers. The company has placed large repeat orders with the following mills: The Amoskeag Mfg. Co., Manchester, N. H.; M. T. Stevens & Son Co., North Andover, Mass., to be installed in their Franklin Falls Mills; The Boott Mills, Lowell, Mass.; The Hathaway Mfg. Co., New Bedford, Mass.; The Schwarzenbach, Huber & Co., Altoona, Pa.; and the Berkeley Co., Berkeley, R. I. The following companies have adopted this system of air moistening: The Wilkesbarre Lace Mfg. Co., Wilkesbarre, Pa.; The Nonquitt Spinning Co., New Bedford, Mass., and the Gosnold Mills, New Bedford, Mass.

Soda ash will only absorb a certain quantity of lime. When lye has been entirely freed from fixed air by the addition of lime, the addition of a small quantity of sulphuric acid causes no effervescence.

The Buffalo Forge Co. have changed their Pittsburg office from 1101 Diamond Bank Building to No. 613 House Building. E. P. Leadbetter, manager.

Isaac B. Markey has recently been elected a vice president of the Eureka Fire Hose Co., New York City, the largest manufacturers of fire hose in the United States.

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Textile manufacturers, superintendents, weavers, spinners, finishers, carders, dyers and knitters are invited to use these columns without charge. Tell us what you want and let us help you find it.

POSITIONS WANTED.

Overseer of carding or spinning. Position wanted by man who knows the business. Good manager of help, can give references. Address 17, care of Cotton.

Treasurer, General Manager, or Superintendent for experienced cotton manufacturer. Large plant preferred. Record twenty years' submitted. Address 21, care Cotton.

Superintendent of Cotton Mills. Position by an American 27 years of age, married, graduate of Philadelphia Textile school and business college. Two years experience as superintendent, four years as overseer of carding. Experience in yarns and weaving. Can furnish best of references. Address 18, care of Cotton.

Manager of Cotton Mill open for an engagement. Technical knowledge and twenty-five years practical experience, on variety, plain and fancy work. Over 20 years in executive capacity with two mills. Highest credentials and record evidences of results. Address 19, care of Cotton.

Superintendent of plain mill, but will take position as overseer of plain weaving. Seventeen years' experience as overseer of warping, slashing, drawing in and weaving. Held position as superintendent eleven years. Address 20, care Cotton.

Superintendent of cotton mill desires position. Sixteen years as carder, weaver and spinner, superintendent and manager. Served four years in New England shops directing all kinds of cotton mill machinery. Experience on white and colored goods. Graduate of the New England Bedford Textile School. Age 37. Address 24, care Cotton.

HELP WANTED.

Spinner wanted. One who has had some experience. Must be thoroughly reliable. Will pay $15.00 per week. Address Humboldt Cotton Mills, Humboldt, Tenn.

Salesman wanted, calling on textile mills to handle as a side line a preparation for low grade cotton cloth. Good proposition. Address Nicetown Mfg. Co., Nicetown, Phila.

Commission House, with offices in Philadelphia and New York, selling cotton yarns, desires the account of a Southern mill that is open for a proposition of this kind. Those interested will be put in communication with the proper parties by addressing D. W. Burrell, 123 Liberty Street, New York City, Room 503.

Party, with capital, wanted to enable the owner of an established patented device for cotton mills to open a Southern factory. From $10,000.00 to $15,000.00 required. Full and satisfactory guarantee. Address Capital, care Cotton.

Commission House in New York City (not connected with the corporations) is in position to handle the acount of a mill, manufacturing duck, osonburgs, cotton rope or twine. Parties interested will be put in communication with this concern by addressing D. W. Burrell, 123 Liberty Street, New York City. om 503

Party wanted to enter the firm of the Pioneer Mfg. Co., of Winston-Salem, N. C. Operations have ceased owing to the death of the president of the company. The machinery is all in good condition and is valued at $5,000. An excellent opening for some one to join the business, or take it at a reasonable price. For further particulars address, The Home Real Estate Insurance and Trust Co., Winston-Salem, N. C.

Manager and Superintendent wanted, who is able to undertake the general management of the construction of four cotton mills on the lines of the M. K. & T. Ry., in Texas. Two of these companies are now completely organized, and the stock all sold. The other two companies are in process of organization. Two of the mills will be complete and running by late fall. The expectation is to make only gray goods. Applicant for the position must be a man of long experience and ability. He will be expected to work in conjunction with architects and contractors until mills are completed, when he will have the general superintendency of all. It is the expectation to pay such a man a salary in keeping with the importance and responsibility of the position. Address 23, care Cotton.